Biological Evaluation and Biological Assessment:

Boulder Creek Fuels Restoration Project

Threatened, Endangered, Proposed and Sensitive Species

Hume Lake Ranger District,
Sequoia National Forest and
Giant Sequoia National Monument

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I. INTRODUCTION

This evaluation documents analysis of the effects of the proposed Boulder Creek Fuels Restoration Project (Boulder Project) on Forest Service Region 5 Sensitive terrestrial animal species and provides an assessment of impacts on federally threatened, endangered, or proposed species, which may inhabit the project area. The project area is located in the Hume Lake Ranger District, Sequoia National Forest and Giant Sequoia National Monument.

It has been determined that no threatened, endangered, or proposed terrestrial animal species are known or are likely to occupy the project area or be adversely affected by implementation of the proposed action or alternatives. The updated species list from the U. S. Fish and Wildlife Service (USFWS) and rationale for exclusion from further analysis for species protected under the Endangered Species Act are found in Appendix A.

Table 1 lists the Region 5 Forest Service Sensitive wildlife species that are either known to occur, or are likely to occur in or near the project area. Appendix B lists Forest Service Sensitive Species and the rationale for excluding species from further discussion.

Hume Lake Ranger District wildlife records, NRIS Wildlife records, the Sequoia National Forest Reptile and Amphibian Data Base, the California Natural Diversity Data Base, species habitat requirements, and species range information from the California Wildlife Habitat Relationships database were used to develop the list of species likely to be found in or near the project area.

Table-1: Sensitive Species that are known to occur within the Project Area or have suitable habitat in the Project Area.

Order	Common and Scientific Names
Birds	Northern goshawk *(Accipiter gentilis)*
Birds	California spotted owl (*Strix occidentalis occidentalis*)
Mammals	Pallid bat *(Antrozous pallidus)*
Mammals	Townsend's big eared bat *(Corynorhinus townsendii townsendii)*
Mammals	American marten *(Martes americana)*
Mammals	Pacific Fisher (*Martes pennanti pacifica*)

II. CONSULTATION TO DATE

Consultation with the U. S. Fish and Wildlife Service is not required. No federally threatened, endangered or proposed species would be affected by this project.

III. CURRENT SPECIES MANAGEMENT DIRECTION

Direction for sensitive species management is provided in the Forest Service Manual (FSM 2672.1), and the Sequoia Forest Land and Resource Management Plan (LRMP) (USDA 1988) as amended by the 2012 Giant Sequoia National Monument Management Plan (USDA 2012). Forest Service manual direction ensures through the Biological Evaluation/Assessment (BE/BA) process that all federally threatened, endangered, proposed, and sensitive species receive full consideration in relation to proposed activities.

Direction to maintain the viability of Region 5 sensitive species is provided by the National Forest Management Act, the Code of Federal Regulations (CFR 219.19), the Forest Service Manual (FSM 2672), and the Sequoia LRMP as amended by the 2012 Giant Sequoia National Monument Management Plan. The LRMP provides general direction to utilize administrative measures to protect and improve the status of endangered, threatened, proposed and sensitive wildlife species.

The project area is also within Giant Sequoia National Monument and subject to standards and guidelines from the 2012 Giant Sequoia National Monument Management Plan (Monument Plan). Small portions of the Boulder project area are located within identified Wildland Urban Interface (WUI) defense or threat zones. The entire project area is within the Southern Sierra Fisher Conservation Area which has specific direction to manage to support fisher habitat requirements.

Key Wildlife Standards & Guidelines:

- "For prescribed fire treatments, use firing patterns, fire lines around snags and large logs, and other techniques to minimize effects on snags and large logs" (Monument Plan, p. 91, S&G #48).

- "In areas outside the wildland urban intermix zone, manage each planning watershed to support fisher habitat requirements. Retain 60 percent of each 5,000- to 10,000-acre watershed in CWHR size class 4 (average dbh of overstory trees between 11 and 24 inches) or greater and canopy cover greater than or equal to 60 percent" (Monument Plan, p. 91, S&G #47).

- "Maintain a limited operating period (LOP), prohibiting activities within approximately ¼ mile of the nest site during the breeding season (March 1 through August 15) unless surveys confirm that California spotted owls are not nesting" (Monument Plan, p. 88, S&G #18).

Project Specific Mitigations:

For any spring burning, active northern goshawk and spotted owl nest sites would be avoided. This would require surveys prior to burning and either putting in handline around the nest stand or modifying the boundary of the burn unit to exclude the area.

IV. DESCRIPTION OF ALTERNATIVES

The purpose of the proposed Boulder Project is to:

- Reduce excessive fuel loads across the landscape;
- Re-establish fire to this fire-adapted ecosystem;

- Reduce the risk of loss of old-growth forest habitat to large scale, stand-replacing wildfires; and
- Reduce the risk of loss of cultural resources to wildfires.

The Boulder Creek Fuel Restoration Project Environmental Assessment (USDA Forest Service 2012b) presents one action alternative and a no action alternative. That document details the alternatives, which are summarized here.

Alternative 1 (No Action). Without prescribed burning, the project area would continue to have high fuel loadings with species composition and structural configurations more susceptible to stand replacing wildfire than desired.

Alternative 2 (Proposed Action). This alternative would reintroduce fire into the lower portion of the Boulder Creek drainage with prescribed burning on 6,000 to 9,000 acres. Not all of the project area would be treated, due to large areas of rock and other features that would need other treatments prior to, or instead of, prescribed fire.

This alternative was designed to limit the impact smoke would have on the airshed. Prescribed fires would be ignited in the fall, with some limited ignitions in the spring, one or two weeks prior to a predicted rain/snow event. This would allow the prescribed fire to burn long enough to achieve resource goals before wetting rains or snow extinguish the active burning in the project area. The duration of active burning and smoke impact on the airshed is expected to be two weeks.

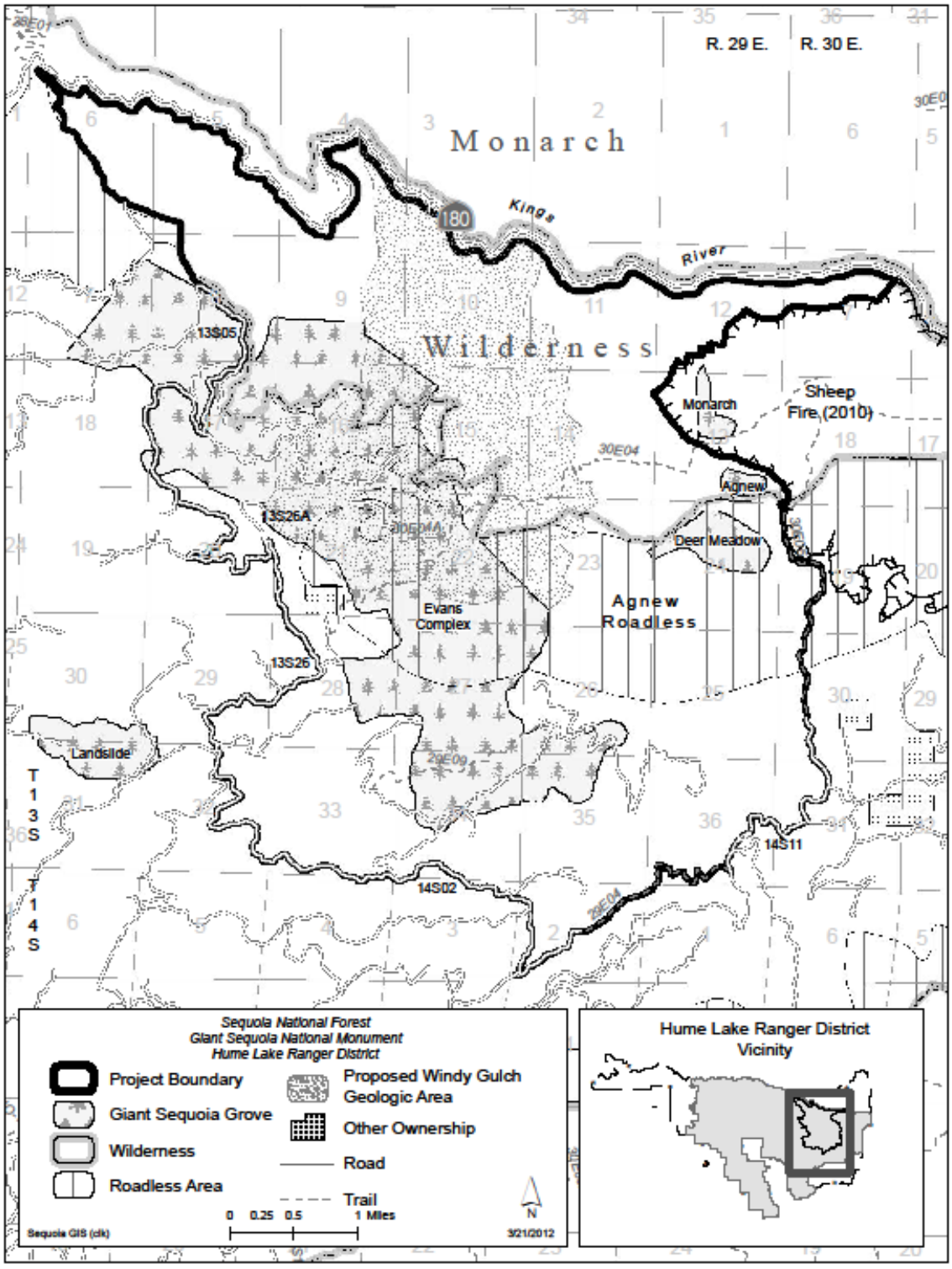
The project area would be burned in sections over approximately 5 years. The burn treatments would begin on the east side of Boulder Creek in year one and work in a counter-clockwise direction over the years. The Boulder Creek Fuel Restoration Project Environmental Assessment (USDA Forest Service 2012b) provides a detail description and maps of the proposed treatments. The treatments are designed to reintroduce fire and produce a mosaic of age classes, tree size and species composition across the landscape. No mechanical treatments or removal of logs or other forest products is proposed under this project.

After the prescribed burn treatments, hand crews would repair trail tread if the burning activities damaged hiking trails. The treadwork may include reestablishing waterbars or other drainage features along the trail. These activities would be designed to reduce the potential for erosion or sedimentation as a result of the fuels reduction activities, and manage that portion of trail to standard.

V. EXISTING ENVIRONMENT

The proposed project area is located in the eastern portion of the Hume Lake Ranger District of Sequoia National Forest and Giant Sequoia National Monument in Townships 13 and 14 South, Ranges 29 and 30 East (Mount Diablo Base and Meridian)(Map 1). The project area boundaries are the Sheep Fire edge and Deer Meadow Trail (Forest Trail 30E05) on the east, portions of Big Meadows and Burton Pass roads (Forest Road (FR) 14S11 and 14S02 respectively) on the south, a portion of FR 13S26 on the west, and State

Map 1. Project Area



Highway 180 and the Kings River on the north. The project area includes portions of Monarch Wilderness, Agnew Roadless Area, the Wild and Scenic South Fork of the Kings River, and giant sequoia groves (Agnew, Deer Meadow and Evans Complex). The project area encompasses approximately 14,385 acres and is within Fresno and Tulare Counties, California. Elevations in the project area range from a low of approximately 3,200 feet near the Kings River to 8,500 feet near the Deer Meadow Grove. The proposed project area is described in detail in the Boulder Creek Fuel Restoration Project Environmental Assessment (USDA Forest Service 2012b).

The habitat in the area is comprised primarily of mixed conifer, oak woodland and chaparral. The higher elevations are dominated by conifer stands, while the lower elevations are in the transition zone between the conifer and hardwood/shrub/grassland vegetation types. Table 2 shows a summary of project area vegetation, based on Forest Service vegetation GIS layers last updated in 2007.

Table 2. Vegetation Types based on CWHR in the Boulder Project Area

Cover Type	Project Area Acres
Coniferous Forest (ponderosa pine, red fir, Sierran mixed conifer and lodgepole pine)	9,718
Hardwood Forest (montane hardwood and montane hardwood-conifer)	2,350
Shrubland (montane chaparral and mixed chaparral)	2,000
Barren	224
Annual grassland	89
Wet meadow	3

SPECIES AND HABITAT ACCOUNTS:

Northern Goshawk *(Accipiter gentilis)*

Habitat Preferences and Biology

Preferred habitat consists of older-age coniferous, mixed, and deciduous forest habitat. The habitat is also composed of large trees for nesting, a closed canopy for protection and thermal cover, and open spaces allowing maneuverability below the canopy (Hargis et al. 1994, Squires and Kennedy 2006). Snags, downed logs, and high canopy cover appear to be preferred habitat features although many east side Sierran territories are relatively open and have fewer snags. Snags and down logs are an important component used by numerous prey species. In addition, many of the species that provide the prey base for northern goshawks are associated with open stands of trees or natural openings containing an understory of native shrubs and grass (Fowler 1988). Northern goshawk demography is strongly influenced by prey availability (Squires and Kennedy 2006).

Northern goshawk nesting habitat is characterized by dense canopy closure (50 to 90 percent) in mature forest with open flight paths under the canopy (McGrath et al. 2003). Nest trees for this species are commonly located on benches or basins surrounded by much steeper slopes (Hargis et al. 1994). Mature trees serve as nest and perch sites, while plucking posts are frequently located in denser portions of the secondary canopy. The same nest may be used for several seasons, but alternate nests are common within a single territory. The chronology of nesting activity varies annually and by elevation. In general, nesting activities are initiated in February with nest construction, egg laying, and incubation occurring through May and June (Dewey et al. 2003). Young birds hatch and begin fledging in late June and early July and are independent by mid-September.

Habitat models based on best professional opinion contained in the California Wildlife Habitat Relationships (CWHR) database rate the following vegetation types and strata as providing high nesting and feeding habitat capability for northern goshawks: structure classes 4M, 4D, 5M, 5D and 6 in Sierran mixed conifer, white fir, ponderosa pine, montane hardwood-conifer, montane riparian, red fir, Jeffrey pine, lodgepole pine, subalpine conifer, and montane hardwood (California Department of Fish and Game 2005). CWHR assigns habitat values according to expert panel ratings. Using the CWHR model, there are 10,235 acres of moderate and high suitability nesting and foraging habitat for northern goshawks in the Boulder project area.

Distribution

While northern goshawks are year-round residents in throughout many higher elevation areas of California, population trends for this species in the state are poorly known (Keane 2008). Surveys for nesting northern goshawks have occurred intermittently in relation to projects or based on reported sightings in portions of Sequoia National Forest. Eight territories have been identified on the Hume Lake Ranger District based on nest location or location of an adult and juvenile.

No goshawk nesting has been documented in the Boulder Creek project area. Historically, nesting sites were found in the Lockwood Grove and near Sunset Meadow, which are adjacent to the project area. Surveys of these two sites in 2007 failed to detect goshawks. Surveys of the eastern portion of the Lockwood Grove PAC in 2012 also failed to detect goshawks.

Risk Factors

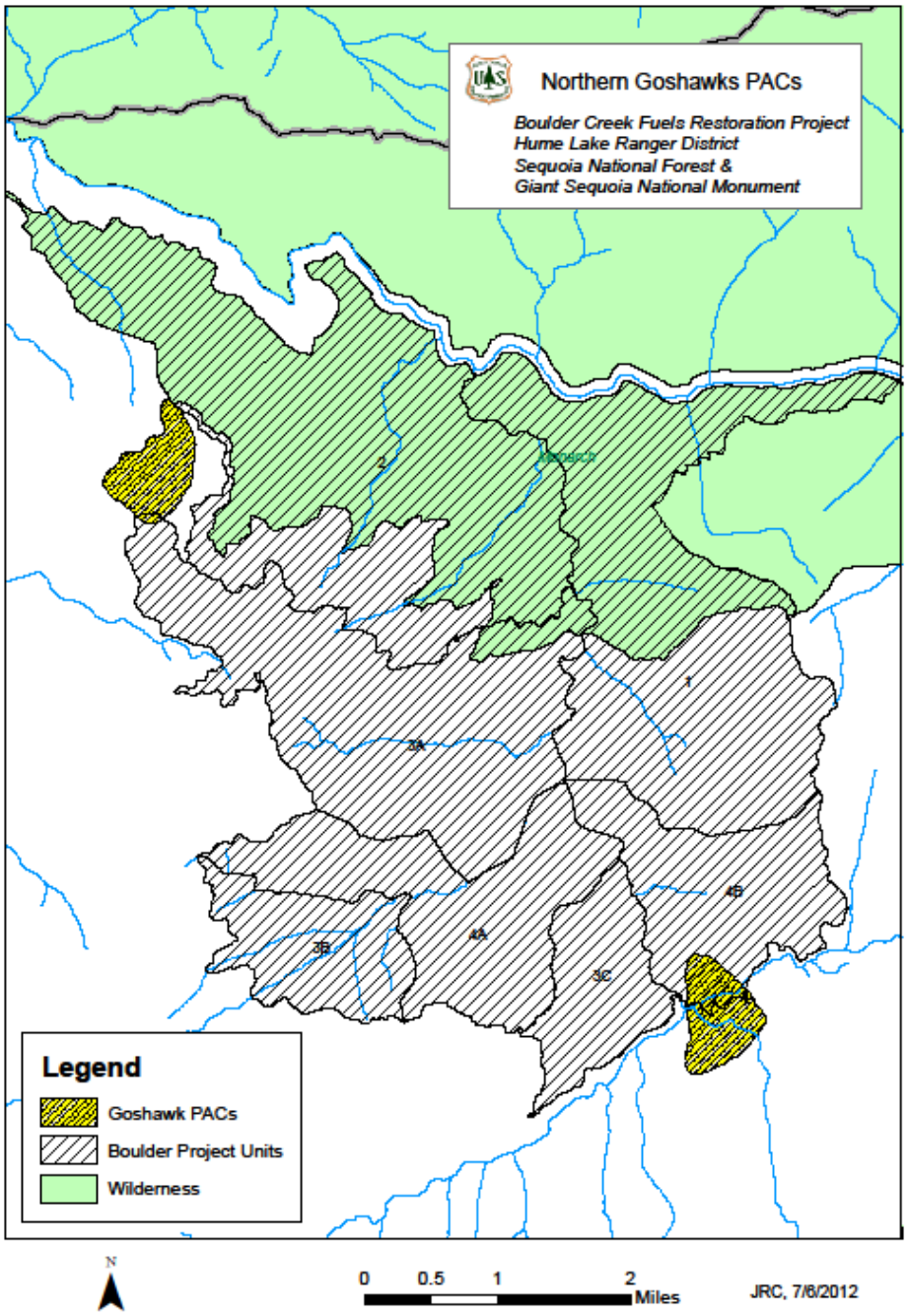
Habitat loss and degradation are the primary known threats to northern Goshawks (Squires and Kennedy 2006). Collection, habitat fragmentation, disturbance at a specific site, and edge effects were described by Gaines et al. (2003) as factors that potentially affect northern goshawks. Human disturbance has the potential to cause northern goshawks to abandon nest sites during the nesting (Boal and Mannan 1994) and post fledging period (February 15 through September 15).

Management and Status

Management direction in the 2012 Monument Plan for northern goshawks includes delineating a 200-acre protected activity center (PAC) around the most recent nest site and alternate nest sites containing the best available suitable forested habitat in the largest contiguous patch as possible (USDA 2012). Portions of two designated northern goshawk PACs fall within the project area (Map 2). A limited operating period of February 15 through September 15 for activities within one-quarter mile of the nest site may be required if

disturbance to nesting activities is possible (USDA 2012). The California Department of Fish and Game has designated northern goshawks as a California species of special concern.

Map 2



California Spotted Owl *(Strix occidentalis occidentalis)*

Habitat Preferences and Biology

California spotted owls are one of three recognized subspecies of spotted owls, including the northern spotted owl, (*Strix occidentalis caurina*) and the Mexican spotted owl (*Strix occidentalis lucida*) (American Ornithologists' Union 1957). Unlike northern spotted owls, some California spotted owls migrate, moving downslope for the winter.

California spotted owls are considered prey specialists (Verner et al. 1992) because they select a few key species (ibid) among the variety of taxa on which they prey, which includes mammals, birds, and insects (Barrows 1980, Hedlund 1996, Smith et al. 1999, Thrailkill and Bias 1989). In the upper elevations of the Sierra Nevada, the primary prey is the northern flying squirrel (*Glaucomys sabrinus*) (Verner et al. 1992). In lower elevations of the Sierra Nevada and in Southern California, the primary prey is the dusky-footed woodrat (*Neotoma fuscipes*) (Thrailkill and Bias 1989). Both flying squirrels and woodrats occur in the diets of owls in the central Sierra Nevada (Verner et al. 1992).

Spotted owls are primarily territorial; however non-territorial owls ("floaters") may also exist in populations and occupy territories after they are vacated (Gutiérrez 1994, LaHaye et al. 1994). Estimates of California spotted owl home range size are extremely variable. Based on an analysis of data from telemetry studies of California spotted owls, mean breeding season, pair home range sizes have been estimated (using 100 percent minimum convex polygon method): 9,000 acres on the Lassen National Forest, true fir type; 4,700 acres on the Tahoe and El Dorado National Forests, mixed conifer type; and 2,500 acres on the Sierra National Forest, mixed conifer type. All available data indicate that home ranges are smallest in habitats at relatively low elevations that are dominated by hardwoods, intermediate in size in conifer forests in the central Sierra Nevada, and largest in the true fir forests in the northern Sierra Nevada (Verner et al. 1992). Home ranges of owls in areas where the primary prey is northern flying squirrels are consistently larger than those where the primary prey is dusky-footed woodrats presumably because woodrats occur in greater densities and weigh more than flying squirrels (Zabel et al. 1992). As of 1992, approximately 25 percent of known owl sites were found where woodrats are the primary prey species and 75 percent of sites were found where flying squirrels are the primary prey species (Verner et al. 1992).

The spotted owl breeding cycle extends from about mid-February to mid- to late September. Egg laying through incubation, when the female spotted owl must remain at the nest, extends from early April through mid- to late May. California spotted owls nest in a variety of tree/snag species in pre-existing structures such as cavities, broken top trees, and platforms such as mistletoe brooms, debris platforms and old raptor or squirrel nests (Gutiérrez et al. 1992, 1995). Young owls typically fledge from the nest in mid to late June. In the weeks after fledging, the young are very weak fliers and remain near the nest tree. Adults continue to bring food to the fledglings until mid- to late September when the young disperse. Summarized information on the dispersal abilities of California spotted owls is scant. Information in Verner et al. (1992) indicates that two-thirds of the juveniles would be expected to disperse at least eight miles.

Not all pairs of California spotted owls nest every year. In fact, over the ten years of demographic studies in the Sierra Nevada, 1992 was the only year when nearly all study owls nested. It is not unusual for owls in an established activity center to skip several years between one nesting and the next. Sites may be vacant for several consecutive years when the population is in decline, but then be reoccupied to support breeding pairs during a population upswing. Spotted owls as a species have apparently evolved high adult survival rates

associated with irregular and unpredictable reproduction (Noon and Biles 1990) their long life span allows eventual recruitment of offspring even if recruitment does not occur each year (Franklin et al. 2000). Spotted owls are long-lived (owls in the wild have been known to be 17 years old) and adult survival rates in the Sierra Nevada are relatively high (greater than 0.80; Noon et al. 1992, Blakesley and Noon 1999, Steger et al. 1999), indicating the species may be able to persist over the short-term even with extensive reduction in the amount of its suitable habitat (Noon et al. 1992).

In the Sierra Nevada, 80 percent of spotted owl sites have been found in mixed conifer forests (sugar and ponderosa pine, white fir, Douglas-fir, giant sequoia, incense-cedar, black oak, and red fir), 10 percent in red fir forests (red and white fir, lodgepole pine, and quaking aspen) 7 percent in ponderosa pine/hardwood forests (ponderosa pine, interior and canyon live oak, black oak, incense-cedar, white fir, tanoak, and Pacific madrone), and 3 percent in other forest types such as east-side pine (ponderosa and Jeffrey pine), and foothill riparian/hardwood (cottonwood, California sycamore, interior live oak, Oregon ash, and California buckeye) (Verner et al. 1992).

Six major studies (Gutiérrez et al. 1992) described habitat relations of the owl in four general areas spanning the length of the Sierra Nevada. These studies examined spotted owl habitat use at three scales: landscape; home range; and nest, roost, or foraging stand. By comparing the amount of time owls spend in various habitat types to amount of habitat available, researchers determined that owls preferentially used areas with at least 70 percent canopy cover, used habitats with 40 to 69 percent canopy cover in proportion to its availability, and spent less time in areas with less than 40 percent canopy cover than might be expected.

In studies referenced by Gutiérrez et al. (1992), spotted owls preferred stands with significantly greater canopy cover, total live tree basal area, basal area of hardwoods and conifers, and snag basal area for nesting and roosting. In general, stands suitable for nesting and roosting have (1) two or more canopy layers, (2) dominant and codominant trees in the canopy averaging at least 24 inches in dbh, (3) at least 70 percent total canopy cover (including the hardwood component), (4) higher than average levels of very large, old trees, and (5) higher than average levels of snags and downed woody material.

Habitat models based on best professional opinion contained in the California Wildlife Habitat Relationships (CWHR) database rate the following types as providing high nesting and feeding habitat capability for spotted owls: structure classes 4M, 4D, 5M, 5D and 6. Using the CWHR model, there are 10,235 acres of moderate and high suitability nesting and foraging habitat for spotted owls in the Boulder project area.

Distribution

California spotted owl populations have two major geographic groups, one inhabiting the Sierra Nevada Province and the other in the Southern California Province, with Tehachapi Pass as the dividing line between the two populations. These regions are distinct geographically. In the Sierra Nevada, California spotted owls are mostly continuously and uniformly distributed, with several breaks in distribution where habitat appears limited due to natural or human caused factors (Beck and Gould 1992).

Sequoia National Forest has conducted surveys for spotted owls across the forest since the early 1980's. Based on those survey results, there area an estimated 120+ spotted owl territories on the Forest. Twenty of these territories are located on the Hume Lake Ranger District in a variety of locations and habitat types. There have been a number of historic spotted owl detections in the Boulder Project area and based on the information available, it is estimated that there are portions of three to five terrritories within the project area.

Population Trends

Four demographic studies of California spotted owls have been ongoing for a number of years within the Sierra Nevada: (1) Eldorado National Forest (since 1986); (2) Lassen National Forest (since 1990); (3) Sierra National Forest (since 1990); and (4) Sequoia-Kings Canyon National Park (since 1990). In 2007, the Sierra Nevada Adaptive Management Project (SNAMP) initiated an additional California spotted owl study on the Tahoe National Forest. The initial study area for this SNAMP study had so few California spotted owls that it was expanded to incorporate the long-term Eldorado National Forest demographic study area.

One of the primary objectives of demographic studies is to monitor rate of change (lambda (λ)) in owl populations (i.e., the number of owls present in a given year divided by the number of owls present the year before). For these demographic models, a lambda of 1 indicates a stable population; less than one indicates the population is decreasing and greater than 1 indicates an increasing population. Lambda is estimated from models and is typically presented as an estimate of the rate of population change, along with a standard error (SE) or a 95% confidence interval (CI). The 95% confidence interval represents the reliability of the estimate of lambda. Managers typically view a population as stable if the 95% confidence interval overlaps a lambda of 1.

For the California spotted owl demographic studies, lambda is estimated individually for each study area at five-year intervals (Franklin et al. 2004, Blakesley et al. 2010). The most recent analysis, using data collected between 1990 and 2005, provided estimates of lambda for all four Sierra Nevada demography study areas (Blakesley et al. 2010):

> **Lassen:** mean estimated lambda is 0.973, with a 95% CI ranging from 0.946 to 1.001;
>
> **Eldorado:** mean estimated lambda is 1.007, with a 95% CI ranging from 0.952 to 1.066.
>
> **Sierra:** mean estimated lambda is 0.992, with a 95% CI ranging from 0.966 to 1.018
>
> **Sequoia-Kings Canyon:** mean estimated lambda is 1.006, with a 95% confidence interval ranging from 0.947 to 1.068

Blakesley et al. (2010) conducted a "meta-analysis" of the data from all four sites, but did not report a mean estimated lambda for the collective data. Researchers update these estimates annually in unpublished reports, but the greater sample sizes of the multi-year analyses result in more significant and meaningful estimates.

The 2010 meta-analysis concluded that, with the exception of the Lassen study area, owl populations were stable, with adult survival rate highest at the Sequoia-Kings Canyon study site. The 95% confidence limit for lambda in the Lassen study area ranged from 0.946 to 1.001 (estimated value 0.973), which barely includes 1, and the analysis estimated a steady annual decline of 2 – 3% in the Lassen study population between 1990 and 2005.

There has been no population monitoring within the Boulder project area. The Sequoia-Kings Canyon study site is less than five miles from the project area and may best represent the population trend of spotted owls in this location.

Risk Factors

General threats to spotted owls include: barred owls, catastrophic large wildfires, disease (West Nile Virus and parasites), insect and pathogen issues (loss of trees), and loss of habitat (urbanization, industrial timber harvest).

Management and Status

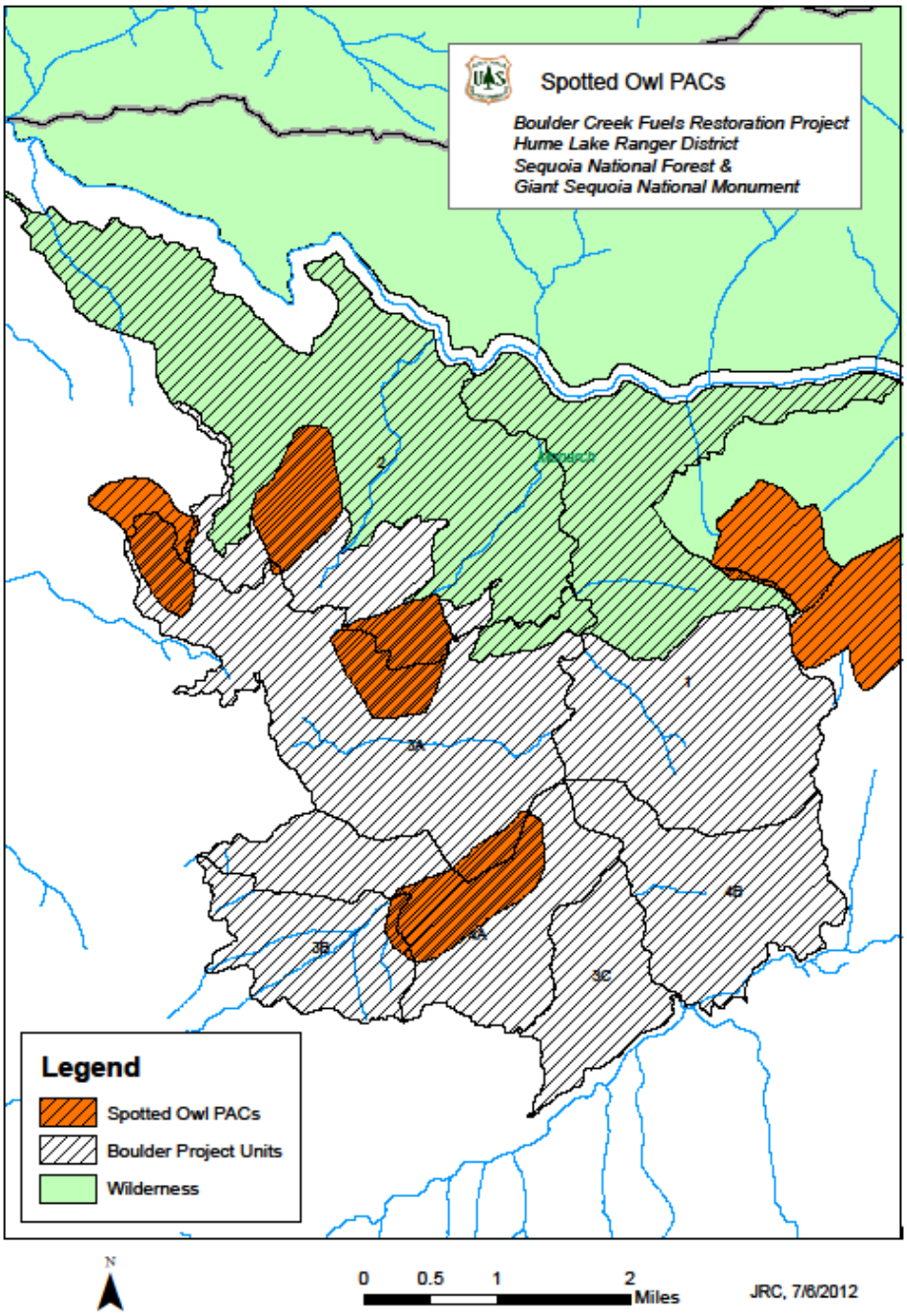
The USFWS has conducted several significant status reviews of the California spotted owl in response to listing petitions (published 12 month findings: USFWS 2003, USFWS 2006). In their most recent review, dated May 15, 2006, the USFWS found that the listing of the California spotted owl was not warranted. They concluded that "impacts from fires, fuels treatments, timber harvest, and other activities are not at a scale, magnitude, or intensity that warrants listing, and that the overall magnitude of threats to the California spotted owl does not rise to the level that requires the protections of the Act" at this time. The California spotted owl is listed as a species of special concern by the California Department of Fish and Game.

Management direction from the 2012 Monument Plan includes delineation of 300 acre protected activity centers (PACs) with associated 300 acre Home Range Core Areas (HRCAs) that have specific restrictions on activity. There are currently 20 spotted owl PACs located on the Hume Lake Ranger District. All or portions of five spotted owl PACs (Map 3) and their associated HRCAs are located within the Boulder project area.

Standards and guidelines for PACs and HRCAs are intended to limit stand altering activities and disturbance in fuel reduction projects and other management activities. In spotted owl PACs outside of defense zones, fuels treatment are limited to prescribed fire and hand thinning of trees less than six inches within a one to two acre area around the nest tree.

In spotted owl HRCAs outside of WUI treatments should be designed to achieve or approach the fuels goals by reducing surface and ladder fuels less than 12 inches dbh. Treatments should not reduce canopy cover in dominant and co-dominant trees by more than 10 percent across a stand following mechanical treatments.

Map 3


Spotted Owl PACs
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Pallid bat *(Antrozous pallidus)*

Habitat Preferences and Biology

Pallid bats are usually found in low to middle elevation habitats below 6000 ft. (Philpott 1997); however, the species has been found up to 10,000 ft. in the Sierra Nevada. A variety of habitats are used, including grasslands, shrublands, woodlands, and coniferous forests (Philpott 1997). At Yosemite National Park, reproductive populations have been detected in giant sequoia groves (Pierson et al. 2006). It was one of the species most commonly encountered in giant sequoias in Giant Forest, Sequoia National Park (Pierson and Heady 1996). They are yearlong residents in most of their range and hibernate in winter near their summer roost (Zeiner et al.1990). Occasional forays may be made in winter for food and water (Philpott 1997).

Day roosts may vary but are commonly found in rock crevices, tree hollows, mines, caves and a variety of human-made structures. Tree roosting has been documented in large conifer snags, inside basal hollows of redwoods and giant sequoias, and bole cavities in oaks. Cavities in broken branches of black oak are very important and there is a strong association with black oak for roosting (Pierson et al. 2006). Roosting sites are usually selected near the entrance to the roost in twilight rather than total darkness. The site must protect pallid bats from high temperatures as this species is intolerant of roosts in excess of 104 degrees Fahrenheit. Pallid bats are also very sensitive to roost site disturbance (Zeiner et al. 1990, Philpott 1997). Night roosts are usually more open sites and may include open buildings, porches, mines, caves, and under bridges (Philpott 1997, Pierson et al. 1996).

Pallid bats are nocturnal and emerge after sunset from day roosts to forage. Pallid bats feed primarily on large, ground-dwelling arthropods, particularly Jerusalem crickets and scorpions (Pierson et al. 2006).

Historic and Current Distribution

There have been few bat surveys in the Monument but pallid bats are presumed present within their elevation range. A study conducted in the Giant Forest area of Sequoia National Park found the pallid bat to be one of the species most commonly associated with giant sequoias (Pierson and Heady 1996). The entire project area is within the mapped CWHR range for this species.

Risk factors

Pallid bats are very sensitive to disturbance of roosting sites. The loss of large trees or snags may reduce the availability of roost structures. Some researchers believe grazing may reduce the quality of foraging habitat (Chapman et al. 1994).The emergence and spread of the pathogenic fungus (*Geomyces destructans*) that infects hibernating bats has the potential to spread to California. Pallid bats may be at risk in the future from white-nose syndrome.

Management and Status

Pallid bats are listed as Sensitive Species in Region 5. There is no specific management direction for this species. Pallid bats are listed as a California species of special concern by the California Department of Fish and Game.

Townsend's big-eared bat (*Corynorhinus townsendii*)

Habitat Preferences and Biology

In California, Townsend's big-eared bats are typically found in low desert to mid-elevation montane habitats, although sightings have been reported up to 10,800 feet (Philpott 1997). Habitat associations include desert, native prairies, coniferous forests, mid-elevation mixed conifer, mixed hardwood-conifer forests, riparian communities, active agricultural areas and coastal habitat types (Kunz and Martin 1982, Pierson et al. 1991). The Mother Lode within the Sierra Nevada foothills has been known historically as the "heart of concentrations" (Pierson and Rainey 1996). Distribution of this species is strongly correlated with the availability of caves and cave-like roosting habitat. Populations have incurred serious declines over the past 40 years in parts of California.

Townsend's big-eared bats are year-round California residents. Individuals are very loyal to their natal sites and usually do not move more than 10 kilometers from a roost site (Pierson et al. 1991, Pierson and Rainey 1996). These bats roost within caves, abandoned mines, and buildings. Buildings must offer cave-like spaces in order to be suitable. This species is highly sensitive to roost disturbance. Night roosts may occur in more open settings, including under bridges (Philpott 1997). Foraging associations include edge habitats along streams and areas adjacent to and within a variety of wooded habitats. Fellers and Pierson (2002) found that foraging was concentrated primarily along the edges of riparian vegetation. Several studies have indicated that this species feeds primarily on moths.

These bats hibernate throughout their range in caves and mines where temperatures are 55 degrees Fahrenheit or less, but generally above freezing. Roost sites are usually in the cooler air near the cave or mine entrance (Barbour and Davis 1969, Kunz and Marten 1982). Individuals may move during winter in response to temperature change (Barbour and Davis 1969).

Historic and Current Distribution

Townsend's big-eared bats are found throughout the west, and are distributed from the southern portion of British Columbia south along the Pacific Coast to central Mexico and east into the Great Plains, with isolated populations occurring in the south and southeastern United States.

Townsend’s big eared bats have been detected in the Windy Gulch Cave Complex, which is just north of the Boulder project area. One cave in this complex, Windy Cliffs Cave, is known to contain a small maternity colony for this species (Tobin and Thomas 2010).

Risk factors

This species is extremely sensitive to disturbance of roosting sites. It is possible that grazing reduces the quality of foraging habitat (Fellers and Pierson 2002). The emergence and spread of the pathogenic fungus (*Geomyces destructans*) that infects hibernating bats has the potential to spread to California. Townsend's big-eared bats may be at risk in the future from white-nose syndrome.

Management and Status

The Townsend's big-eared bat is listed as a California species of special concern by the California Department of Fish and Game. There is no specific management direction for this species. However, cave and mine closures have been modified to provide suitable access and egress for bats when occupancy has been verified.

American Marten (*Martes americana*)

Habitat Preferences and Biology

American marten habitat includes mature mesic conifer forests interspersed with meadows, providing abundant small mammal prey, features for resting and denning, and sufficient canopy coverage for protection from avian predators (Buskirk and Ruggiero 1994). Conifer forest types important to American marten within the Sierra Nevada include red fir (*Abies magnifica*), lodgepole pine (*Pinus contorta*), subalpine conifer, mixed conifer-fir, Jeffrey pine (*Pinus jeffreyi*), and eastside pine (Simon 1980, Spencer 1981, Spencer et al. 1983, Zeiner et al. 1990, Cablk and Spaulding 2002). In their study on the Tahoe National Forest (Sagehen Creek), Spencer et al. (1983) found American martens select riparian lodgepole pine stands at elevations below 6,726 feet and old-growth red fir stands above 6,726 feet. American martens were apparently using the lodgepole stands to hunt for Douglas squirrels.

Mature coniferous forests provide large-diameter trees and snags, large downed logs, and moderate to high canopy closure, and interspersed riparian areas and meadows, important attributes for prime American marten resting, denning, and foraging habitat. American marten within the northern Sierra Nevada select stands with 40 to 60 percent canopy closure for both resting and foraging and avoid stands with less than 30 percent canopy closure (Spencer et al. 1983). Koehler et al. (1975) also stated that American marten avoid stands of less than 30 percent canopy closure, while Bull et al. (2005) found American marten within northeast Oregon avoid stands with less than 50 percent canopy closure. American marten generally avoid habitats that lack overhead cover, presumably because these areas do not provide protection from avian predators (Allen 1982, Bissonette et al. 1988, Buskirk and Powell 1994, Spencer et al. 1983). In Yosemite National Park, American martens avoid areas lacking overhead cover and prefer areas with 100 percent overhead cover, especially when resting (Hargis and McCullough 1984). In contrast, Cablk and Spaulding (2002) snow-tracked American marten at the Heavenly Ski Resort (Lake Tahoe) and found that where they were detected, the mean canopy closure was only 30 percent as American marten frequently crossed and foraged within open ski runs.

At the landscape scale, patches of preferred habitat and the distribution of open areas with respect to these patches may be critical to the distribution and abundance of American martens (Buskirk and Powell 1994). Small open areas, especially meadows, and regenerating stands (or plantations) are used by American marten as foraging habitat, but these openings are of optimum value when they occupy a small percent of the landscape and occur adjacent to mature forest stands meeting requirements for denning or resting habitat. In general, American marten appear to avoid landscapes with greater than 25 to 30 percent of the area in openings, even where suitable habitat connectivity exists (Chapin et al. 1998, Hargis et al. 1999). Poole et al. (2004) found American marten within British Columbia categorically avoid non-forested cover types, but they did extensively use young (<40 years of age) deciduous stands during the summer.

Various studies in the Sierra Nevada indicate that American martens have a strong preference for forest-

meadow edges, and riparian forests appear to be important foraging habitats for voles (Spencer et al. 1983, Martin 1987). Voles are common in riparian zones and are important year-round prey for American marten within the Sierra Nevada (Zielinski et al. 1983, Zielinski 1984, Hargis and McCullough 1984, Martin 1987). Both Simon (1980) and Spencer (1981) found heavy American marten use along Sierra Nevada meadow edges. American marten preferred foraging in areas within 197 feet of a meadow, but avoided areas greater than 1,312 feet from a meadow and rarely ventured farther than 33 feet within a meadow (Spencer et al. 1983). Spencer et al. (1983) also found American martens prefer areas with an abundance of Douglas squirrel feeding sign. Kirk and Zielinski (2009) concluded that high-elevation, late seral forests appear important for marten population persistence.

Dead and down material such as large snags, large downed woody material, and debris piles (especially near the ground) appear to provide protection from predators, prey sources, access to subnivean (below snow) spaces, and protective thermal microenvironments, especially in the winter (Buskirk and Powell 1994, Spencer et al. 1983, Thompson and Harestad 1994, Bull et al. 2005). Bull et al. (2005) found American marten within northeastern Oregon prefer habitats with high volumes of dead and down trees, and to avoid areas with low densities of dead trees. Sites used for subnivean entry have (1) greater percent cover of coarse woody debris, (2) greater total volume of coarse woody debris, (3) greater numbers of log layers, (4) greater volume of undecayed and moderately decayed logs, (5) less volume of very decayed logs, and (6) fewer small root masses than surrounding forest stands (Corn and Raphael 1992). Hence, large coarse woody debris (snags, downed logs, large branches, and root masses) are an important winter habitat component for both resting/denning and foraging.

Numerous food habits studies have been conducted across the range of American marten with approximately half indicating voles (*Microtus* spp. and *Clethrionomys* spp.) are a dominant food item (Martin 1994). *Microtus* also contribute to the diet of American marten within the Sierra Nevada (Zielinski et al. 1983, Zielinski 1984, Hargis and McCullough 1984, Martin 1987), but in some areas are apparently not as important as sciurids and deer mice (*Peromyscus* spp.) (Simon 1980, Zielinski and Duncan 2004). Douglas squirrels (*Tamiasciurus douglasii*) in particular may be highly important to American marten within California because of both their prevalence in the diet and their relatively high biomass compared to other prey items. However, the occurrence of voles versus tree squirrels in diet studies may also reflect the seasonal timing of the study. Zielinski et al. (1983) suggested that American martens within California switched over to Douglas squirrels when winter snows made voles more difficult to capture (and perhaps squirrels more vulnerable). Structural habitat complexity enhanced, rather than diminished, the efficiency of predatory search by martens (Andruskiew et al. 2008).

Birds, mostly passerines, are also well represented in American marten diets within the Sierra Nevada (Zielinski et al. 1983, Hargis and McCullough 1984, Zielinski and Duncan 2004), although Zielinski (1986) cautions that birds are often over-represented in scat samples because of the durability of feathers compared to mammalian hair. Insects are also prevalent in American marten diets within the Sierra Nevada (Simon 1980, Martin 1987, Zielinski and Duncan 2004). Zielinski and Duncan (2004) found that nearly 21 percent of 150 scats collected on the Sequoia National Forest contained wasps (Vespidae/Eumenidae). Simon (1980) on the Inyo National Forest, however, suggest that while insects have a high occurrence, their biomass contribution is low, and possibly not significant. Plant material, including berries (*Ribes*), seeds (*Pinus*), and hypogeous fungi (mostly *Melanogaster* spp.) also show strongly in Sierra Nevada diets (Simon 1980, Hargis and McCullough 1984, Martin 1987, Zielinski and Duncan 2004). How much of this material is incidental ingestion originating in bird crops or rodent stomachs are unknown.

Parturition occurs between mid-March and late April. The young are reared in dens, and the mother moves the young among dens. The dens are important to recruitment and may represent a special habitat need (Ruggiero et al. 1994). American marten natal dens typically are found in cavities in large trees, snags, stumps, logs, burrows, caves, rocks, or crevices in rocky areas. The dens are lined with vegetation and occur in structurally complex, late successional forests (Buskirk and Ruggiero 1994). Post-natal dens are typically found in cavities, logs, underground, or in slash piles (Bull and Heater 2000). Canopy cover and the number of large old trees in these patches exceed levels available in the surrounding suitable habitat. The availability of habitat suitable for natal dens may limit reproductive success and population recruitment; this has direct repercussions on future population size (Buskirk and Ruggiero 1994).

In a study within Giant Sequoia National Monument, Zielinski et al. (1997) found 36 percent of the rest sites used by martens were in trees. Martens rested in conifers more often than hardwoods and tended to reuse rest sites with a frequency of 25.5 percent.

Habitat relationships for this species are defined by the California Wildlife Habitat Relationships (CWHR) models, which model habitat suitability for California's terrestrial vertebrates (California Department of Fish and Game 2005). The CWHR habitat stages that are moderately to highly important for American marten are: 4M, 4D, 5M, 5D, and 6, particularly within red fir, lodgepole pine, subalpine conifer, mixed conifer-fir, Jeffrey pine, and eastside pine (California Department of Fish and Game 2005). Using the CWHR model, there are 8,891 acres of moderate and high suitability habitat for American marten in the Boulder project area.

Historic and Current Distribution

In California, American marten were distributed throughout the Sierra Nevada and California Cascades, while the Humboldt marten (*M. a. Humboldtensis)* occurred in the Coast ranges, from the Oregon border southward to Sonoma County, primarily within the range of redwood (*Sequoia sempervirens*) and adjacent near-coast coniferous forest types. In a genetic study, Slauson et. al (2008) found American marten within the Sierra Nevada differed substantially from coastal populations of martens, suggesting American marten populations were not a historically genetically homogeneous population and divergence may have occurred in separate glacial refugia.

American martens are currently distributed throughout the Sierra Nevada and Cascades (Buskirk and Zielinski 1997) between elevations of 5,500 to 10,000 feet, but most often found in the Sierra Nevada above 7,200 feet (Cablk and Spaulding 2002). For example, 81 percent of the 31 American marten detected over an eight-year study on the Stanislaus National Forest were recorded at elevations above 6,562 feet. This distribution coincides with snowfall levels of greater than 9.1 inches per winter month (Krohn et al. 1997). Extensive American marten surveys have been conducted across Sequoia National Forest, with numerous detections, including within the southern portion of the Boulder project area.

Risk factors

Martens are among the most habitat-specific mammals in North America (Buskirk and Powell 1994), and changes in the quality, quantity, and distribution of available habitat could affect their distributional range. Risks to marten habitat include activities that remove overhead cover, large-diameter trees, or coarse woody

debris and activities that convert mesic to xeric sites with associated changes in prey communities (Campbell 1979). Although overhead cover is regenerated via plant successional processes, loss of coarse woody debris can only be ameliorated by artificial additions to the system or by the growth and decadence of new large-diameter trees (Buskirk and Ruggiero 1994).

In northern Utah, martens responded negatively to low levels of habitat fragmentation when the average distance between openings was less than 95 m (317 feet; Hargis et al. 1999). Andren (1994) suggested that as landscapes become fragmented there is a negatively synergistic combination of increasing isolation and decreasing patch size of suitable habitat that compounds the results of simple habitat loss. For some species, this may result in a decrease of greater magnitude than can be explained solely by the loss of suitable habitat. Marten may be a species that demonstrates this pattern of exponential population declines at relatively low levels of fragmentation (Bissonette et al. 1997).

Roads can result in the direct and indirect mortality of individual American marten, as well as the degradation of habitat. Roads can fragment habitat and affect the ability of the animals to use otherwise suitable habitat on either side of the road, and the associated presence of vehicles and humans, can cause animals to avoid otherwise suitable habitats near roads. For example, Robitaille and Aubry (2000) found American martens to concentrate their activity away (greater than 300 m) from roads (although use near roads was not precluded). Vehicular collisions resulting in American marten mortality have been known to occur on Giant Sequoia National Monument. Most were associated with long paved stretches of road where vehicles tended to maintain higher speeds.

Management and Status

The 2012 Monument Plan requires the establishment of den site buffers that consist of 100 acres of the highest quality habitat in a compact arrangement surrounding American marten dens. No den site buffers have been established in the project area. Canopy closure retention guidelines for spotted owls and northern goshawks maintain habitat characteristics also preferred by American marten. All suitable habitat for American martens in the Monument is within the Southern Sierra Fisher Conservation Area, which also requires the retention of habitat structures important to American martens. The American marten is listed as a California species of special concern by the California Department of Fish and Game.

Pacific Fisher *(Martes pennanti pacifica)*

Habitat Preferences and Biology

Pacific fishers are mesocarnivores belonging to the mink family (Mustelidae). In the Sierra Nevada, fisher habitat occurs in mid-elevation forests (Grinnell et al. 1937, Zielinski et al. 1997) largely on National Forest System lands, below the elevations of national parks and wilderness areas. In the southern Sierra Nevada, fishers occur sympatrically with martens (*Martes americana*) at elevations of 5,000 to 8,500 feet in mixed conifer forests (Zielinski et al. 1995). The Sierra Nevada status and trend monitoring project (USDA 2006) has detected fishers as low as 3,110 feet and as high as 9,000 feet in the southern Sierra Nevada, which are considered to be extremes of the elevation range.

In the southern Sierra Nevada, the preferred habitats include mixed conifer, ponderosa pine (*Pinus ponderosa*) and montane hardwoods. Oaks, particularly black oak (*Quercus kelloggii*) appear to be a key component of the habitat (Carroll et al. 1999, Zielinski et al. 2004a). Forest structural characteristics within fisher home ranges are strongly skewed toward mid- to late-seral stands with high canopy cover; large, cavity-forming trees are required for resting and denning habitat (Seglund 1995, Zielinski et al. 2004b, Yaeger 2005). Geographic conditions correlated with core fisher habitat in California include complex topography, steep slopes, and proximity to water (particularly in the southern Sierra Nevada) (Zielinski et al. 2004b, Carroll 2005).

Riparian corridors (Heinemeyer and Jones 1994) and forested saddles between major drainages (Buck 1983) may provide important dispersal habitat or landscape linkages for the species. Riparian areas are important to fishers because they provide concentrations of large rest site elements, such as broken top trees, snags, and coarse woody debris (Seglund 1995), perhaps because they persisted in the mesic riparian microtopography through historic fires.

Purcell, et al. (2009), studied resting structures used by Pacific fishers on an area of Sierra National Forest. They determined that canopy cover was the most important variable distinguishing areas used as rest sites by fishers. Large live trees and large snags made up the majority of the rest structures. Trees used as resting sites were often the largest available in the area. Resting sites were on steeper slopes, closer to streams and with smaller and more variable trees than random sites.

Habitat suitable for resting and denning sites is thought to be most limiting to the population; therefore, these habitats should be given more weight than foraging habitats when planning or assessing habitat management (Powell and Zielinski 1994, Zielinski et al. 2004a). Fishers generally use at least one rest site per day, and rarely reuse rest site structures (Kilpatrick and Rego 1994, Seglund 1995, Zielinski et al. 2004a). Zielinski et al. (2004a) argue that retaining and recruiting trees, snags and logs of at least 39 in. dbh, encouraging dense canopies and structural diversity, and retaining and recruiting large hardwoods are important for producing high quality fisher habitat and resting/denning sites.

The following California Wildlife Habitat Relationships (CWHR) types were thought to be important to fishers: generally structure classes 4M, 4D, 5M, 5D and 6 (stands with trees 11" diameter at breast height or greater and greater than 40% canopy cover) in ponderosa pine, montane hardwood-conifer, Klamath mixed-conifer, Douglas-fir, Sierran mixed conifer, montane riparian, aspen, redwood, red fir, Jeffrey pine, lodgepole pine, subalpine conifer, and eastside pine (Timossi 1990). CWHR assigns habitat values according to expert panel ratings. CWHR2 is a derivative of the CWHR fisher habitat relationship model constructed by Davis et al. (2007). They used best available science to revise the statewide model and eliminate some forest types that appeared to contribute little to fisher habitat: aspen, eastside pine, lodgepole pine, montane riparian, red fir, and subalpine conifer. The model has been further refined to reflect only those forest types present in the southern Sierra Nevada: Jeffrey pine, montane hardwood-conifer, Ponderosa pine, Sierran mixed-conifer and white fir, terming it CWHR 2.1. Using the CWHR 2.1 model, there are 8,057 acres of moderate and high suitability habitat in the Boulder Creek Fuels Restoration Project area.

The maintenance of the southern Sierra Nevada fisher population may be critical to conserving fisher populations in the western United States (Zielinski 2004a) because it appears to support unique genetic and behavioral adaptations to extreme environmental conditions for this species. Several studies have revealed genetic patterns that appear to arise from the disjunct nature of fisher population distributions in the Pacific

States, and point to reduced genetic diversity in the southern Sierra Nevada population (Drew et al. 2003, Wisely et al. 2004). Wisely et al. (2004) analyzed 19 fisher genetic samples from three different locations to investigate the role of landscape features in fisher genetics in the narrow strip of suitable forested habitat in the southern Sierra Nevada. The study concluded that fisher expansion southward into the west coast mountain chains occurred less than 5,000 years ago, leading to reduced genetic diversity and increased population structure at the southern periphery of its range. This study suggested that dispersal was limited, and thus indicated that aggressive conservation strategies may be needed to preserve the existing southern Sierra Nevada fisher population and reconnect extant populations to the north. Consistent with this genetic analysis, the Kings River was postulated to constitute a major barrier to gene flow, perhaps permeable to just one migrant every 50 generations (Wisely et al. 2004). The number of migrants needed per generation to maintain genetic viability, is highly dependent on the specific demographic and genetics characteristics of the population (Mills and Allendorf 1996) (Vucetich and Waite 2000). Thus, the results reported by Wisely et al. (2004) were cause for concern.

More recently, approximately 163 additional fisher DNA samples from a broad distribution across the entire southern Sierra fisher sub population have been analyzed as part of an on-going doctoral dissertation. A progress report on this work, Tucker et al. (2009) indicated much higher levels of population connectivity in the southern Sierra Nevada. A cluster analysis using the program GENELAND (Guillot et al. 2005) signaled the presence of three intermixing population groupings: one in the far northwest portion of the Sierra National Forest, another encompassing the rest of Sierra National Forest through Sequoia/Kings Canyon National Park, and a southern third on the Sequoia National Forest (Tucker et al. 2009). Preliminary data indicate that at least one individual per generation moves from the northwest Sierra to the central population group, and up to 3.5 individuals per generation are interchanged between the central and southern genetic group (Tucker et al. 2009). Thus, based on this preliminary information, the Kings River does *not* appear to constitute a significant barrier to fisher movement, as hypothesized in Wisely et al. (2004). It should be emphasized that Tucker's work is ongoing and the results and interpretations may change in the continuing process. However, the results are based on a much larger and better distributed dataset than the previously published information and appear to be the best available and most current data.

Historic and Current Distribution

Grinnell et al. (1937) described the distribution of fishers in California as a continuous arc from the northern Coast Range eastward to the southern Cascades, and then south through the western slope of the Sierra Nevada. Fishers historically occurred in the Lassen, Plumas, Tahoe, Lake Tahoe Basin, Eldorado, Stanislaus, Sierra, and Sequoia National Forests. As of 1995, Zielinski et al. determined that fishers remain extant in just two areas comprising less than half of the historic distribution: northwestern California and the southern Sierra Nevada from Yosemite National Park southward, separated by a distance of approximately 250 miles.

Status and trend monitoring for fishers in the Sierra Nevada was initiated in 2002; the monitoring objective is to be able to detect a 20 percent decline in population abundance and habitat (USDA 2006). This monitoring includes intensive sampling to detect population trends on the Sierra and Sequoia national forests, where fishers currently are found, and was supplemented by less intensive sampling in suitable habitat in the central and northern Sierra Nevada specifically designed to detect population expansion. From 2002–2008, 439 sites were surveyed throughout the Sierra Nevada on 1,286 sampling occasions. Fishers have been detected

at 112 of 251 (44.6%) sites sampled during the 7 monitoring seasons (Truex 2009). Fishers have not been detected in the northern, central, or eastern Sierra.

Preliminary results indicate that fishers are well-distributed in portions of the Sequoia and Sierra NFs; but occupancy rates are consistently higher on the Sequoia than the Sierra (USDA 2005). Comparisons to southern Sierra Nevada survey data from the 1990's suggest that the extent of occurrence for fisher may have expanded during the past 10 years (USDA 2005).

Risk factors:
Threats to the West Coast Distinct Population Segment

The USFWS (2004) identified major threats to fishers in the West Coast Distinct Population Segment, discussed relative to specified factors for listing under Section 4 of the Endangered Species Act. Only those threats deemed by USFWS (2004) to be "important" to the entire West Coast DPS are summarized in this section. The reader is referred to the Federal Register for the complete USFWS 2004 discussion.

Factor A. The Present or threatened Destruction, Modification, or Curtailment of the Species' Habitats or Range. The extent of past and present timber harvest can fragment fisher habitat, reduce it in size, or change the forest structure to unsuitable for fishers. Both fuels reduction activities and effects of wildfire could result in loss and/or fragmentation of habitat. Development, recreation and roads also pose a threat of habitat loss/fragmentation as well as direct mortality. Research literature suggests that the loss and fragmentation of suitable habitat by roads may have played a role in the reduction of fishers from the central Sierra Nevada and its failure to re-colonize there.

Factor B. Overutilization for commercial, recreational, scientific or educational purposes. Historical trapping resulted in a severe population decline. Current mortalities or injuries from incidental trapping even where fisher trapping has been eliminated could be frequent and widespread enough to prevent population recovery or re-occupation of suitable habitat.

Factor C. Disease or Predation. There is potential for disease outbreaks to occur in these small, isolated fisher populations with devastating effects. Mortality from predation by mountain lion, bobcat, coyote or large raptors could pose a significant threat to fishers.

Factor D. The inadequacy of existing regulatory mechanisms. Some protections are available, but highly variable from jurisdiction to jurisdiction, and limited. Current regulations fail to provide sufficient certainty that conservation efforts will be implemented or that they will be effective in reducing threats to fishers.

Threats to Fishers in the Southern Sierra Nevada

- **Uncharacteristically Severe Wildfire.**

Uncharacteristically severe wildfire is defined as fire occurring beyond the historical range of natural variation in terms of scope, intensity and duration. These stand-replacing fires affect large areas of the landscape, decreasing or removing key fisher structural and habitat elements including large trees, overstory and understory canopy, vegetative diversity, snags, and logs. Landscape permeability for fisher movements at all scales may decrease as a result. As part of the threat evaluation completed for the West Coast Fisher

Conservation Assessment (Lofroth et al. 2010), uncharacteristically severe wildfire ranked as high threat in the southern Sierra Nevada geographic area.

Fragmented landscapes created by uncharacteristically severe wildfires are likely to eliminate fisher habitat linkages, either permanently via vegetative type conversion or temporarily until recovery occurs. Landscape permeability to fishers is decreased. This results in detrimental impacts to fisher daily movements and energy balance, creates barriers to dispersal movements, affects the establishment of home ranges, and prolongs or prevents breeding season movements. These impacts may decrease fisher survival. Overall population fitness is affected by individual survival and mortality. Direct mortality as a result of fire may occur in extreme cases depending upon season (e.g. kit loss in reproductive season, loss of adults in fast-moving canopy firestorms either directly or from potential smoke inhalation).

Following wildfire, prey species abundance and community composition will shift. An initial increase in abundance of disturbance-adapted prey species may occur at the expense of species diversity with a gradual reversal of this trend as succession occurs. Although prey abundance may increase, prey availability will not necessarily follow due to fisher reluctance to enter open areas. Extensive burned areas can create dispersal barriers for prey. The West Coast Fisher Biology Team speculated that the abundance of prey available following fire may support pre-fire population levels of fishers that have been compressed into adjusted home ranges. This prey abundance may not persist over time, however, and result in displacement or loss of fishers on the margins of remaining habitat (Macfarlane, pers. comm.). Displaced individuals could create conspecific competition if packed into the remaining habitat, which could, in turn, increase disease transmission.

Large trees, snags and logs are used as resting structures (Purcell et al. 2009). Fishers exhibit strong selection for rest and den sites based upon forest structure and canopy cover. Changes in the frequency, abundance, and distribution of these habitat elements may create conditions inimical to successful reproduction, as well as survival of the young to recruitment into the population. Lack of well-distributed escape cover will result in increased predation.

It is unknown whether or to what extent fishers exhibit site fidelity. Habitat changes due to uncharacteristically severe wildfire could temporarily disrupt fisher social organization in a manner difficult to conceptualize (Macfarlane, pers. comm.). Resident animals may continue to occupy the burned area, but might not be replaced via recruitment of young into the population or via emigration of other adults upon their death. These socially-mediated population impacts may be exhibited as a lag effect. That is, they may require an average fisher lifetime (10 or more years) under a statistically rigorous monitoring program for at least that period of time to become evident.

- **Vegetation Manipulation to Reduce Risk of Uncharacteristically Severe Wildfire**

Truex and Zielinski (2005) estimated the change in fisher habitat suitability pre- to post-treatment in fuels reduction projects at two sites in the Sierra Nevada. Four primary treatments were applied for effects assessment: control (no treatment); mechanical harvest (usually including mastication following harvest); mechanical harvest followed by prescribed burning; and an area where prescribed burning was the only treatment. Study areas were the Blodgett Forest Research Station (BFRS) and a satellite site at Sequoia-Kings Canyon National Park (SEKI).

This study generally concluded that fire and fire surrogate treatments have modest but significant short-term effects to the quality and availability of fisher resting habitat, as well as canopy closure. At BFRS, mechanical as well as mechanical plus fire treatments significantly reduced fisher resting habitat and average canopy closure. At the SEKI site, the late season burn treatment had a significant effect on fisher habitat suitability as well as canopy closure. The short-term treatment effects to foraging habitat at both sites were generally not significant. This may be explained by the broad spectrum of foraging habitat parameters, rendering it less likely to be a limiting factor to fisher than resting habitat.

The effect of greatest magnitude was a reduction in canopy closure. All treatments reduced canopy closure. Canopy closure, however, recovers relatively quickly compared to the loss of large dead or live trees. Re-measurements of treatment units in this study in 5 or 10 years will provide information on how quickly the canopy actually recovers.

In areas where fisher habitat suitability is already low or marginal, the predicted effects may have a disproportionately large impact to habitat recovery. On the other hand, the short-term negative effects of the treatments may result in beneficial effects on subsequent stand development.

Another limitation of this study is that it focused upon effects at the individual stand level. As wide-ranging predators, fisher function at larger landscape scales within their habitats. Thus, it is important to analyze the spatial and temporal array of treatments in a landscape context. The more broadly distributed the treatments are over space and time, the lower the likelihood of significant negative effects in a landscape context. It does seem that such treatments distributed over space and time should have lower impacts that large-scale catastrophic wildfire.

One last caveat offered by Truex and Zielinski (2005) in interpreting the study results is to recognize that a reduction in habitat suitability does not necessarily equate to loss of suitability. Population level implications to localized reductions in habitat suitability have yet to be studied. To decrease effects to fisher habitat suitability, the authors recommend planning treatments to maintain elements important to fisher (e.g. large diameter hardwoods).

Prescribed fire treatments may create risks to fishers through the production of heat and smoke. To assess this threat, researchers monitored a female with kits at a den site in the Kings River study area of Sierra National Forest. The female moved her den site twice, apparently in response to the fire and/or activity of firefighting personnel. Sensors placed inside known den trees in the area found them to be well protected from temperature change and measured carbon monoxide levels far too low to cause mortality (Craig Thompson, pers. com. 2012).

The Conservation Biology Institute conducted a computer simulation study of the interactions between fuels management, forest fires, fisher habitat, and the fisher population in the southern Sierra Nevada (Spencer et al. 2008). Their study area included this analysis area. Treating only 2 percent of the treatable landscape every 5 years (or up to 10 percent of the treatable landscape over 20 years) had no significant effect on fire or fishers at the landscape level, while treating 4 to 8 percent of the treatable landscape every 5 years (or up to 20-32 percent of the treatable landscape over 20 years) was effective in reducing fire and benefiting fishers.

- **Habitat Fragmentation or Loss of Connectivity.**

Habitat connectivity is a key to maintaining fisher within a landscape. Activities under Forest Service control that result in habitat fragmentation or population isolation pose a risk to the persistence of fishers. Timber harvest, fuels reduction treatments, road presence and construction, and recreational activities may result in the loss of habitat connectivity resulting in a negative impact on fisher distribution and abundance.

The level of road and trail density and associated noise disturbance may influence how fishers utilize available habitat. Dark (1997) for example studied fishers in a well-roaded study area (i.e. areas without roads did not exist) on the Shasta-Trinity National Forest. The results suggested that fishers were detected more frequently at sites where roads were closed by the use of gates or otherwise designed to discourage vehicular traffic. Fishers used habitats with a greater density of low-use roads, and favored landscapes with more contiguous, unfrequented forests and less human activity. Campbell (2004, In USFWS 2004) noted that sample units examined within the central and southern Sierra Nevada region occupied by fishers were negatively associated with road density. Within the project area, the road density is approximately 1.6 miles of roads per square mile. Route density thresholds for fishers are not readily available in the literature.

Vehicular collisions resulting in fisher mortality have been reported in a number of studies. Heinemeyer (1993), for example, noted vehicular collision as a source of fisher mortality. Instances of fisher mortality on Sequoia National Forest have also occurred with an estimated dozen collisions noted over the last 10 years. Most were associated with long paved stretches of road where vehicles tended to maintain higher speeds, which is not the case in the project area.

Management and Status: Fishers are long-lived, have low reproductive rates, large home ranges (for carnivores of their size) and exist in low densities throughout their range (Powell 1993). This implies that fishers are highly prone to localized extirpation, colonizing ability is somewhat limited, and populations are slow to recover from deleterious impacts. Isolated populations are therefore unlikely to persist.

The U. S. Fish and Wildlife Service determined that the West Coast population of fisher is warranted for listing under the Endangered Species Act of 1976, et seq., but precluded due to heavy agency workloads (USFWS 2004), and included it on the list of Endangered Species Act "Candidate" species.

The California Fish and Game Commission listed the fisher as a candidate for protection under the California Endangered Species Act in April 2009. In September 2010 the California Fish and Game Commission announced it would not protect the Pacific fisher under the California Endangered Species Act. The Forest Service has considered fishers to be a Sensitive Species in the Pacific Southwest Region since 1984 (Macfarlane 1994).

The 2012 Monument Plan requires the establishment of fisher den site buffers that consist of 700 acres of the highest quality habitat in a compact arrangement surrounding verified birthing and kit rearing dens. Fisher den site buffers have a limited operating period of March 1-June 30 for all new projects. Canopy closure retention guidelines for spotted owls and northern goshawks maintain habitat characteristics also preferred by fisher.

No den site buffers have been established in or near the project area. The entire project area is within the Southern Sierra Fisher Conservation Area, which requires the retention of habitat structures important to fishers, including canopy cover and large trees.

VII. EFFECTS ANALYSIS

Northern Goshawks and California spotted owls

Determining Direct and Indirect Effects
The direct and indirect effects of the alternatives in the Boulder Project on northern goshawks and California spotted owls were evaluated using five primary metrics:

1. **Vegetation Density (canopy cover, basal area)**. Canopy cover and tree basal area are important habitat elements for both species.

2. **Abundance of small, medium and large trees (> 11" dbh, CWHR Size Classes 4, 5 and 6)**
Large trees are necessary for nest and roost structures for goshawks and spotted owls.

3. **Number of large snags (> 15" dbh)**. Large snags provide nesting and roosting structures in addition to providing habitat for prey species.

4. **Down woody debris** provides cover and habitat for important prey species.

5. **Special Management Areas.** Protected Activity Centers (PACs) and Home Range Core Areas (HRCAs) exist within the project area and may be impacted by the alternatives.

Note: The number of acres and miles of roads reported in this document were derived from a GIS analysis and are based on totals within the project area or analysis area boundaries. There was no distinction made between public, private or state owned lands. The analysis was based on data existing in July 2012.

Alternative A (No Action)

This alternative would maintain current conditions in the short-term.

Density (canopy cover, basal area):
Existing basal area and canopy cover would be maintained in the short-term. Long-term effects would depend on random chance of fire ignition and weather conditions. Current trends appear to be toward warmer conditions that would lead to more drought-related mortality, increased insect mortality and greater fire severity.

Abundance of small, medium and large trees (> 11" dbh, CWHR Size Classes 4, 5 and 6):
There would be no change in the number of trees >11" dbh, unless influenced by a stand replacing event such as high severity fire or drought related mortality.

Number of large snags (> 15" dbh):
There would be no change in the number of snags >15" dbh, unless the area is affected by a stand replacing event such as high severity fire or drought related mortality.

Down woody debris:
There would be no change in the amount of down woody debris, unless the area is affected by a stand

replacing event such as high severity fire or drought related mortality.

Special Management Areas:
There would be no change in habitat within PACcs or HRCAs, unless the area is affected by a stand replacing event such as high severity fire or drought related mortality.

Under this alternative, wildlife habitat in the project area would continue to diverge from the desired natural condition, leading to the increased risk of uncharacteristically severe wildland fire that could cause permanent loss of habitat important to these species.

Alternative B (Proposed Action)

Alternative B proposes to use prescribed fire on 6,000 to 9,000 acres of the Boulder Creek area (Map 2) over a three to five year period. The entire project area would not be burned; fire may be excluded in plantations, cultural resource sites and other areas of concern. Protecting some of the cultural sites would require hand-thinning shrubs and some small trees (less than 6 inches dbh) on an estimated total of 4-5 acres. The burning prescription is intended to result in a low intensity backing fire that would result in a mosaic of effects. No direct mortality of either of these species is expected as a result of prescribed fire. The risk of direct mortality of wildlife from incineration, or asphyxiation during prescribed fire is considered to be low (Pilliod et al. 2006).

Density (canopy cover, basal area):
Underburning is expected to kill some shrubs and small trees. Little mortality is expected in larger trees. The effect of hand-thinning to protect cultural sites on habitat quality is expected to be insignificant, since this is the same kind of material expected to be removed by the prescribed burn. The prescribed fire would result in a short-term reduction in understory canopy cover and slight reduction in basal area on some of the acres underburned. The reduction would be in small trees (<10" dbh) and shrubs. Treatments in riparian areas would be limited to backing fire, so the reduction of canopy cover in these areas is expected to be minimal.

Abundance of small, medium and large trees (> 11" dbh, CWHR Size Classes 4, 5 and 6):
In this alternative, trees >11" dbh, may be killed in prescribed burning or removed as safety hazards. Modeling (FOFEM5) for this projected mortality of approximately three to five percent of the conifers in the mid seral size class (CWHR size class 4). Given the burning prescription, mortality of trees greater than 24" dbh is expected to be rare. Some large trees that are along trails used as control lines would be felled if they are safety hazards.

Number of large snags (> 15" dbh):
Prescribed fire treatments are expected to both create new snags and result in the loss of some existing snags on some of the acres with active fire treatments. It is possible that a small number of snags near containment lines would be felled if they provide a safety hazard to fire personnel. Implementation of this alternative would result in little change in the number of large snags (depending on fire behavior).

Down woody debris:
There would be a reduction in small down woody debris present in the project area following underburning. However, the burn prescription is designed to to retain an average of 10 – 20 tons per acre of down woody material.

Special Management Areas: There are portions of two northern goshawk PACs, five spotted owl PACs and the associated HRCAs within the Boulder project area.

- Goshawk PAC# R05F13D51T04: Approximately seven acres within Unit 3A which may be underburned in years 2-3. This area was surveyed in 2012 and no goshawks were detected.

- Goshawk PAC# R05F13D51T07: Approximately 81 acres within Unit 4B. No treatment is planned in this area.

- Spotted owl PAC# FRE0118: Fourteen acres in Unit 1 would be underburned in 2012.

- Spotted owl PAC# FRE0012: Approximately eight acres within Unit 2 would be underburned in the fall of year two. Approximately 149 acres within Unit 3A would be underburned in year 2-5. For any spring burning, any active nest site would be avoided. This would require surveys prior to burning and either putting in handline around the nest stand or modifying the boundary of the burn unit to exclude the area. No spotted owls were detected in this PAC in surveys in 2012.

- Spotted owl PAC# FRE0060: Approximately 299 acres within Unit 2 would be underburned in the fall of year two. About four acres are in Unit 3A and may be burned in year 2-5.

- Spotted owl PAC# FRE0061: Approximately 163 acres within Unit 2 would be underburned in the fall of year two. About 199 acres are in Unit 3A and may be burned in year 2-5. For any spring burning, active nest sites would be protected or avoided.

- Spotted owl PAC# FRE0043: Most of this PAC (330 acres) is within Unit 4A, which would receive no treatment. Approximately 69 acres within Unit 3A and 29 acres within Unit 3B may be underburned in year 2-5. For any spring burning, active nest sites would be protected or avoided.

Summary:
While prescribed fire could cause some short-term disruption of these species use of the project area, most of the treatments would occur outside the nesting season. Effects from spring burning would be mitigated with the use of buffers if necessary. The return of fire to this area would provide for long-term maintenance of the habitat. As with other native species, it is assumed that the restoration of a natural fire regime and the maintenance of a mosaic of old growth forest conditions throughout the project area would benefit northern goshawks and spotted owls. Only large stand replacing fires, as would occur from wildfires following long periods of fire exclusion, would be a direct threat to them.

Pallid bat and Townsend's big-eared bat

Determining Direct and Indirect Effects
The direct and indirect effects of the alternatives in the Boulder Project on pallid bats and Townsend's big-eared bats were evaluated using the following metrics:

1. **Roosting areas**

Caves are used by both species; large snags and trees are also used by pallid bats. Both these species are very sensitive to disturbance of roosting sites.

2. **Foraging habitats**
Pallid bats prefer dry open areas like rock outcrops while Townsend's big-eared bats forage in mesic habitats, including riparian areas.

Alternative A (No Action)

This alternative would maintain current conditions in the short-term.

Alternative B (Proposed Action)

Alternative B proposes to use prescribed fire on 6,000 to 9,000 acres of the Boulder Creek area (Map 2) over a three to five year period. The entire project area would not be burned; fire may be excluded in plantations, cultural resource sites and other areas of concern. The burning prescription is intended to result in a low intensity backing fire that would result in a mosaic of effects. No direct mortality of either of these species is expected as a result of prescribed fire.

Roosting areas:
Although caves offer direct protection from flames, fire near occupied cave roosts can impact bats by altering vegetation around the cave, which could affect airflow and alter the microclimate in the cave (Carter et al. 2002). The proposed action includes a mitigation to protect cave entrances (Gallagos 2012). Spherical incendiary devices would not be dropped within 500' above cave entrances or within 200' below or on either side of cave entrances.

Smoke impacts to cave roosting bats depend on a cave's airflow characteristics. Airflow is largely determined by differential external and internal air temperatures. Depending on the air temperature, a fire that creates smoke up wind from an entrance could potentially fill the cave with smoke (Carter et al. 2002). Smoke has the potential to adversely affect bats, but burning would take place in the fall when it would not threaten the maternity colony. In addition, given the expected fire behavior in the proposed action, smoke impacts would be less than a wildfire in the area.

Foraging habitats:
Given the burning prescription, this project is not expected to change the number of acres of open habitat in the area. Riparian areas may experience low-intensity backing fires, which could distrupt foraging patterns of Townsend's big-eared bats in the short-term.

Summary:
While prescribed fire could cause some short-term disruption of these species' use of the project area, fire provides long-term maintenance of the habitat. As with other native species, it is assumed that the restoration of a natural fire regime and the maintenance of a mosaic habitat conditions throughout the project area would benefit northern pallid bats and Townsend's big-eared bats.

American Marten and Pacific Fisher

Determining Direct and Indirect Effects
The direct and indirect effects of the alternatives in the Boulder Project on American martens and Pacific fishers were evaluated using five primary metrics:

1. **Vegetation Density (canopy cover, basal area)**. Canopy cover and tree basal area are important habitat elements for both species.

2. **Abundance of small, medium and large trees (> 11" dbh, CWHR Size Classes 4, 5 and 6)**
Large trees are necessary for den and rest structures for American martens and Pacific fishers.

3. **Number of large snags (> 15" dbh)**. Large snags provide denning and resting structures in addition to providing habitat for prey species.

4. **Down woody debris** provides cover and habitat for important prey species and den sites for martens.

5. **Habitat connectivity.** Habitat connectivity is a key to maintaining marten and fisher within a landscape. Activities that result in habitat fragmentation or population isolation pose a risk to the persistence of these species.

Alternative A (No Action)
This alternative would maintain current conditions in the short-term.

Alternative B (Proposed Action)
Alternative B proposes to use prescribed fire on 6,000 to 9,000 acres of the Boulder Creek area (Map 2) over a three to five year period. The entire project area would not be burned; fire may be excluded in plantations, cultural resource sites and other areas of concern. Protecting some of the cultural sites would require hand-thinning shrubs and some small trees (less than 6 inches dbh) on an estimated total of 4-5 acres. The burning prescription is intended to result in a low intensity backing fire that would result in a mosaic of effects. No direct mortality of either of these species is expected as a result of prescribed fire.

Density (canopy cover, basal area):
Underburning is expected to kill some shrubs and small trees. Little mortality is expected in larger trees. The effect of hand-thinning to protect cultural sites on habitat quality is expected to be insignificant, since this is the same kind of material expected to be removed by the prescribed burn. The prescribed fire would result in a short-term reduction in understory canopy cover and slight reduction in basal area on some of the acres underburned. The reduction would be in small trees (<10" dbh) and shrubs. Treatments in riparian areas would be limited to backing fire, so the reduction of canopy cover in these areas is expected to be minimal.

Abundance of small, medium and large trees (> 11" dbh, CWHR Size Classes 4, 5 and 6):
In this alternative, trees >11" dbh, may be killed in prescribed burning or removed as safety hazards. Modeling (FOFEM5) for this projected mortality of approximately three to five percent of the conifers in the mid seral size class (CWHR size class 4). Given the burning prescription, mortality of trees greater than 24" dbh is expected to be rare. Some large trees that are along trails used as control lines would be felled if they are safety hazards.

Number of large snags (> 15" dbh):
Prescribed fire treatments are expected to both create new snags and result in the loss of some existing snags on some of the acres with active fire treatments. It is possible that a small number of snags near containment lines would be felled if they provide a safety hazard to fire personnel. Implementation of this alternative would result in little change in the number of large snags (depending on fire behavior).

Down woody debris:
There would be a reduction in small down woody debris present in the project area following underburning. However, the burn prescription is designed to to retain an average of 10 – 20 tons per acre of down woody material.

Habitat connectivity:
Habitat suitable for martens and fishers in the Boulder project area is part of a nearly continuous block of habitat across the middle elevation area of the Hume Lake Ranger District. Any opening created by the prescribed fire could reduce connectivity. However, given that the burning prescription is intended to result in a low intensity fire and little reduction in tree canopy cover is expected, little loss in connectivity is expected.

Summary:
While the loss in understory canopy (shrubs and small trees) may reduce the value of habitat in the short-term, most of the important resting/denning structures would be retained. It is assumed that the restoration of a natural fire regime and the maintenance of a mosaic of old growth forest conditions throughout the project area would benefit American marten and Pacific fishers. Only large stand replacing fires, as would occur from wildfires following long periods of fire exclusion, would be a direct threat to these species.

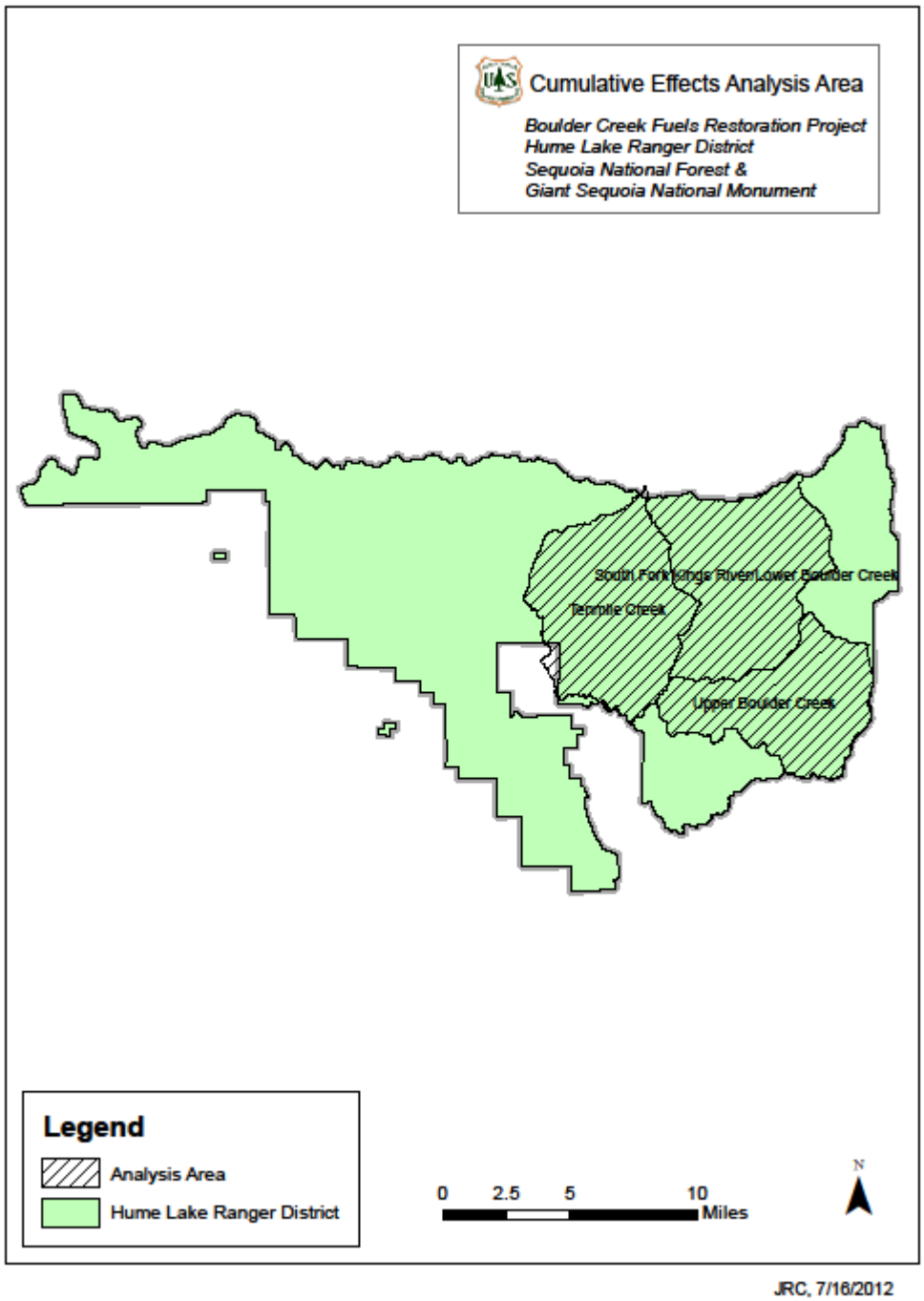
Wildlife Cumulative Effects

Cumulative Effects Analysis

The spatial scale for the cumulative effects analysis of the Boulder Project is composed of the Upper Boulder Creek, Lower Boulder Creek and Tenmile Creek subwatersheds, which cover approximately 68,175 acres. This is an appropriate scale for determining cumulative effects, since it includes all suitable habitat potentially affected by implementation of the Boulder Project.

The temporal scale for this analysis extends from 2008 to 2017. Vegetation data for the Forest includes spatial ecological and vegetation layers created from remote-sensing imagery obtained at various points in time, which are verified using photo-imagery, on-the-ground measurements, and tracking of vegetation-changing actions or events. Past actions considered in this analysis are listed below and include those that have occurred since the last forest mapping update in 2007. For assessment of future projects, the Forest completes a quarterly "Schedule of Proposed Actions (SOPA)" which tracks proposals that are ongoing or have sufficient detail to insure they are reasonably foreseeable. The total list of actions presented on the SOPA is not included here. Some projects have been cancelled or are undergoing revision, with others not included because they have limited scope and intensity and present no appreciative impact on available habitat.

Map 4


Cumulative Effects Analysis Area
Boulder Creek Fuels Restoration Project
Hume Lake Ranger District
Sequoia National Forest &
Giant Sequoia National Monument
South Fork Kings River
Lower Boulder Creek
Tenmile Creek
Upper Boulder Creek
Legend
Analysis Area
Hume Lake Ranger District
0 2.5 5 10
Miles
N
JRC, 7/16/2012

Climate Change

Climate changes will likely cause changes in the distribution of individual species in the project area. The precise effects of climate change on individual species are difficult to predict and will not be addressed in the effects analysis. It is generally agreed that the range of some species will shift and that climate change will be an additional environmental stressor, but the effects on the individual species evaluated for the Boulder Project are not currently known to any degree of certainty. It is unclear whether climate change would benefit or adversely affect these species over the long term.

Mortality or a Reduction in Fitness from Toxins (e.g. rodenticide)

Rodenticides and other toxicants used at illegal marijuana grow sites may lead to fisher mortality or a loss of fitness (Gabriel et al. 2012). No specific information is available regarding the illegal use of toxicants in the analysis area but it is reasonable to assume they are present and a threat to many wildlife species.

Past (after 2007), Current and Future Activities

Past and Current Activities

Grazing: Portions of the Buck Rock, Hoist and Horse Corral cattle grazing allotments are within the Boulder Project cumulative effects analysis area. Because grazing is a past, ongoing, and foreseeable future action and because use levels and associated impacts from this activity are not expected to change as a result of implementation of the proposed action, cattle grazing activity is not expected to contribute measurable impacts to sensitive species habitats.

Vegetation Management:

- *Roadside Hazard Tree Removal*: Beginning in 2009, dead or damaged trees along major district roads (Including some in the analysis area) that posed a safety hazard or danger to public/employees were felled. Some of the trees were removed.
- *Prescribed Burning*: The Tornado Burn Project resulted in underburning approximately 200 acres since 2008. Additional small piling and burning projects have occurred along some of the major roads in the analysis area.

Wildfires: No wildfires greater than 25 acres have occurred in the analysis area since 2007. The Sheep fire, which occurred in 2010, was in a subwatershed adjacent to the analysis area.

Recreation: The analysis area is used regularly by campers, hunters and OHV users. There are approximately 215 miles of road in the analysis area, with State Highway 180 providing primary vehicular access. Because recreation is a past, ongoing, and foreseeable future action and because use levels and associated impacts from this activity are not expected to change as a result of implementation of the proposed action, recreation is not expected to contribute measurable impacts to habitats.

Potential Future Activities (From the SOPA dated 04/2012)**:**

Vegetation Management/Silviculture Treatments:

- *Kirkland Plantation Thin*: Proposes to masticate small trees (less than 10 inches dbh) and brush causing overstocked conditions in plantations near Kirkland Meadow and underburn or pile and burn fuel concentrations leaving 80-120 trees per acre and pockets of untreated shrubs for wildlife.
- *Hume District Roadside Hazard Tree Removal*: Proposal to fell dead or damaged trees along district roads (Including 35 miles in the analysis area) that pose a safety hazard or danger to public/employees using these routes. Some trees may be removed after down woody debris requirements are met.

Cumulative Effects

Vegetation Density (canopy cover, basal area):
The prescribed fire in the action alternative could result in a short-term reduction in understory canopy cover and slight reduction in basal area on a maximum 6,000 to 9,000 acres of the Boulder Project area (not all this areas will be underburned) . In addition to the acres of habitat potentially affected by this project, tree canopy closure and understory shrub canopy closure was reduced on fewer than 100 acres by the Tornado burn project. The Kirkland Thin Project would reduce tree canopy closure and understory shrub canopy closure on a maximum of 477 additional acres. The 2009 Roadside Hazard Tree Removal Project removed a small number of trees from this habitat. The future Hume District Roadside Hazard Tree Removal Project could remove trees along roads in this habitat if they are safety hazards. There are no other past, present or foreseeable future actions potentially affecting vegetation density within the analysis area. The cumulative effects would occur on less than 14% of the analysis area. Given the prescriptions for these projects, density changes are expected to be small and limited to patches within the analysis area.

Abundance of small, medium and large trees (> 11" dbh, CWHR Size Classes 4, 5 and 6):
Modeling (FOFEM5) of the Boulder Project projected mortality of zero to five percent of the conifers in these size classes (mortality is projected to be primarily in small trees or size class 4). The 2009 Roadside Hazard Tree Removal Project removed a small number of trees >11" dbh. The future Hume District Roadside Hazard Tree Removal Project could remove trees in this size class if they are safety hazards. The Kirkland Thin Project would not affect trees >11" dbh, unless they are killed during prescribed burning. There are no other past, present or foreseeable future actions potentially affecting the abundance of small, medium or large trees within the analysis area. Therefore, trees in size classes most important to northern goshawks, spotted owls American martens and Pacific fishers would be little affected. No reduction in size class is expected for any of the more than 47,000 acres classed as 4, 5 or 6 within the analysis area.

Number of large snags (> 15" dbh):
In addition to the forest habitat potentially affected by this project, snags were both created and lost by the Tornado burn project on fewer than 100 acres. The 2009 Roadside Hazard Tree Removal Project removed a small number of snags that were safety hazards. The future Hume District Roadside Hazard Tree Removal Project could remove snags along roads if they are safety hazards. The Kirkland Thin Project could remove snags if they are safety hazards and both create and remove snags through prescribed burning. Snags that are safety hazards at developed recreation sites, like campgrounds, may also be removed if necessary. There are no other past, present or foreseeable future actions potentially affecting snags within the analysis area.

Down woody debris:
In addition to the potential reduction of down woody debris from implemementation of the Boulder Project, there was a small reduction in down woody debris present following the Tornado burn project on fewer than

100 acres in the analysis area. Prescribed burning in the Kirkland Thin Project could result in the reduction of down woody debris on a maximum of 238 acres. There are no other past, present or foreseeable future actions with the potential to measurably affect down woody debris within the analysis area. The cumulative reduction of down woody debris would occur on less than 14% of the analysis area. In addition, the burn prescriptions are designed to to retain an average of 10 – 20 tons per acre of down woody material, especially the larger down logs considered of greater value for wildlife.

Special Management Areas:
The Hume District Roadside Hazard Tree Removal Project could potentially fell and remove trees within or adjacent to one northern goshawk PAC (T02) and three spotted owl PACs/ HRCAs (FRE0042, FRE0064, FRE0088) within the analysis area. There are no other past, present or foreseeable future actions with the potential to measurably affect habitat quality within special management areas in the analysis area.

Habitat connectivity:
The analysis area currently provides a nearly continuous block of habitat suitable for northern goshawks, California spotted owls, American marten and Pacific fisher. The exception would be the lower elevation shrublands along the Kings River, which may pose a barrier to these species.

The reduction of understory vegetation and any openings in the canopy created by the prescribed fire in the Boulder Project, along with the Tornado burn project, Kirkland Thin Project and Hazard Tree Removal Project could reduce habitat connectivity at the local scale. At the sub-watershed scale there is expected to be little or no loss of connectivity.

Bat Roosting Areas:
There are no past, present or foreseeable future actions with the potential to affect caves within the analysis area. As detailed above, little change in the number of large snags and large trees available to bats is anticipated through cumulative effects.

Bat Foraging Habitats:
No changes in rock outcrops would occur. Cumulative effects to riparian habitat in the analysis area would be limited to backing fire, with a small reduction in canopy cover.

Cumulative Effects Summary:
It is anticipated that implementation of the Boulder Project Alternative B, in combination with other past, present or foreseeable future actions, would result in a short-term reduction in understory canopy cover, a slight reduction in basal area, mortality of some small trees, possible felling of hazard trees and the reduction of down woody debris on less than 14% of the analysis area.

VIII. DETERMINATIONS

This biological evaluation analyzes the potential effects of the proposed project on federally protected and Forest Service Region 5 Sensitive Species. For this analysis, it is assumed that the project mitigations as stated in section III are incorporated into the project design.

FEDERALLY LISTED SPECIES

No federally listed species is likely to occupy the project area or be affected by implementation of any of the alternatives.

REGION 5 FOREST SERVICE SENSITIVE SPECIES

Northern goshawk and California spotted owl:

Alternative A (No Action)
Alternative A would maintain the current condition and have **no effect** on northern goshawks or California spotted owls or their habitat. The area would continue to have high fuels loading and a risk of stand replacing fire greater than the desired condition.

Alternative B
It is my determination that Alternative B of the Boulder Creek Fuels Restoration Project **may affect individuals,** but is not likely to result in a trend toward Federal listing or loss of viability of northern goshawks or California spotted owls. The cumulative effects of this alternative would lead to a short term reduction of canopy cover and down woody debris on less than 14% of the existing habitat in the analysis area. While prescribed fire could cause some short-term disruption of these species use of the project area, most of the treatments would occur outside the nesting season. Effects from any spring burning would be mitigated with the use of buffers if necessary.

The return of fire to this area would provide for long-term maintenance of the habitat. As with other native species, it is assumed that the restoration of a natural fire regime and the maintenance of a mosaic of old growth forest conditions throughout the project area would benefit northern goshawks and spotted owls.

Pallid Bat and Townsend's big-eared bat:

Alternative A (No Action)
Alternative A would maintain the current condition and have **no effect** on pallid bats or Townsend's big-eared bats. The area would continue to have high fuels loading and a risk of stand replacing fire greater than the desired condition.

Alternative B
It is my determination that Alternative B of the Boulder Creek Fuels Restoration Project **may affect individuals,** but are is not likely to result in a trend toward Federal listing or loss of viability of pallid bats or Townsend's big-eared bats. While prescribed fire could cause some short-term disruption of these species' use of the project area, it is assumed that the restoration of a natural fire regime and the maintenance of a mosaic habitat conditions throughout the project area would benefit northern pallid bats and Townsend's big-eared bats.

American Marten and Pacific Fisher:

Alternative A (No Action)

Alternative A would maintain the current condition and have **no effect** on American martens or Pacific fishers. The area would continue to have high fuels loading and a risk of stand replacing fire greater than the desired condition.

Alternative B

While the expected loss in understory canopy (shrubs and small trees) may reduce the value of habitat in the short-term, it would not make habitat unsuitable. Most of the important resting/denning structures would be retained and new ones (e.g. snags) would likely be created. Based upon these facts, it is my determination that Alternative B of the Boulder Creek Fuels Restoration Project **may affect individuals**, but is not likely to contribute to the need for federal listing or result in a loss of viability of Pacific fishers in the analysis area. Also, Alternative B **may affect individuals,** but is not likely to result in a trend toward Federal listing or loss of viability of American martens. The restoration of a natural fire regime and the maintenance of a mosaic of old growth forest conditions throughout the project area would be expected to benefit both American marten and Pacific fishers. Implementation of this alternative would also be expected to reduce the risk of stand replacing fire and a large-scale loss of structural elements important to these species.

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Appendix A. **Federally Threatened, Endangered, & Proposed Species, Sequoia National Forest**
Species list for Sequoia National Forest, updated via FWS web site:
(http://www.fws.gov/sacramento/ES_Species/Lists/es_species_lists_NF-form-page.htm)
Report Date: 6/4/2012; Database last updated by USFWS: 9/18/2011

Common Name *(Scientific Name)*	**Listing Status**	**Habitat Requirements**	**Effects Determination**	**Rationale**
Tipton kangaroo rat *(Dipodomys nitratoides)*	FE	Alkali sinks and valley floor habitat.	No effect	Project area is outside known historic range and is not suitable habitat.
California bighorn sheep *(Ovis canadensis californiana)*	FE	Rugged mountain areas, mostly eastern Sierra with small historic range on western edge of Kern Drainage.	No effect	Project area is located outside known historic range.
San Joaquin kit fox *(Vulpes macrotis mutica)*	FE	Valley floor annual grassland, alkali washes generally below 1,000'.	No effect	Project area is located outside known historic and elevation range.
SW Willow flycatcher *(Empidonax trailii extimus)*	FE	Riparian forest and meadow with dense willow habitat and standing water.	No effect	Project area is located outside known range of this subspecies.
California condor *(Gymnogyps californianus)*	FE, CH	Mountain and foothill rangeland and forest habitats; nests on cliffs and in large trees.	No effect	No roost areas, critical habitat, or historic nest areas in the project area.
Least Bell's vireo *(Vireo bellii pusillus)*	FE	Riparian forest.	No effect	No current or historic detections within the project area. Historic range limited to Kern Valley.
Blunt-nosed leopard lizard *(Gambelia sila)*	FE	Open grassland, valley floor below 1,000'.	No effect	Project area is located outside known historic and elevation range.
Giant garter snake *(Thamnophis gigas)*	FT	Valley floor aquatic habitats.	No effect	Project area is located outside known historic range.
California red-legged frog *(Rana aurora draytonii)*	FT	Low gradient streams and ponds with emergent vegetation.	No effect	No current or historic detections within project area.
California tiger salamander *(Ambystoma*	FT	Annual grassland and grassy understory of valley-foothill hardwoods.	No effect	Project area is located outside known historic range.

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(http://www.fws.gov/sacramento/ES_Species/Lists/es_species_lists_NF-form-page.htm)
Report Date: 6/4/2012; Database last updated by USFWS: 9/18/2011

Common Name *(Scientific Name)*	**Listing Status**	**Habitat Requirements**	**Effects Determination**	**Rationale**
californiense)		Breed in vernal pools, not in streams.		
Delta smelt *(Hypomesus transpacificus)*	FT	Limited to San Joaquin/Sacramento Delta.	No effect	No potential effect on species because there is No outlet from project area to Delta.
Little Kern golden trout *(Oncorhynchus mykiss whitei)*	FT, CH	Native to cold water streams in Little Kern Drainage.	No effect	Project area is located outside known range.
Vernal pool fairy shrimp *(Branhinecta lynchi)*	FT	Valley floor annual grassland, alkali washes generally below 1,000'.	No effect	Project area is located outside known historic range and no contains no suitable habitat.
Valley elderberry longhorn beetle *(Desmocerus californicus dimorphus)*	FT	Elderberry plants with base > 1" diameter in chaparral and riparian habitats below 2,900'.	No effect	Project area is above elevation range.
Kern primrose sphinx moth *(Euproserpinus euterpe)*	FT	Valley foothill, oak woodland and chaparral associated with evening primrose. Range limited to Walker Basin area.	No effect	Project area is located outside known historic range.

FE = Federally Endangered; FT = Federally Threatened; PT = Proposed for Federal listing; CH = Designated Critical Habitat

Appendix B. Forest Service Sensitive Animal Species in Sequoia National Forest (*List Updated 10/15/2007)*

Species	**Status**	**Habitat**	**Effects Determination**	**Rationale**
Birds				
Northern goshawk *(Accipiter gentilis)*	FSS, CSSC	Dense mixed conifer forest to open eastside pine	**may affect individuals,** but is not likely to result in a trend toward Federal listing or loss of viability	See analysis and effects determination above.
Western yellow billed cuckoo *(Cocczyus americanus occidentalis)*	FSS, FC, SE	Dense riparian forest. On SQF, only known from Lake Isabella.	No effect	Project area outside known range and lacks suitable habitat.
Little Willow flycatcher	FSS,SE	Large meadow complexes with dense	No effect	No detections or suitable habitat in or near the project

Appendix B. Forest Service Sensitive Animal Species in Sequoia National Forest (*List Updated 10/15/2007)*

Species	Status	Habitat	Effects Determination	Rationale
(Empidonax trailii brewsterii)		willow and standing water, up to 8,000'		area.
Bald Eagle *(Haliaeetus leucocephalus*)	FSS, SP, SE	Lakes and open water. Nests on large trees.	No effect	Species and habitat not impacted by the proposed action.
Great gray owl *(Strix nebulosa)*	FSS, SE	Large meadows & openings 2,500 – 9,000'. Dense forest and large snags for nesting.	No effect	Species and habitat not impacted by the proposed action. No suitable habitat within burn units.
California spotted owl *(Strix occidentalis occidentalis)*	FSS, CSSC	Dense forest (>40% canopy closure), preference for stands with ≥2 layers, but open enough to allow for observation and flying space to attack prey. Substantial amounts of dead woody debris are desirable.	**may affect individuals,** but is not likely to result in a trend toward Federal listing or loss of viability	See analysis and effects determination above.
Mammals				
Pallid bat *(Antrozous pallidus)*	FSS, CSSC	Open habitats, rocky crevices, tree cavities, mines, caves, or buildings for maternity roosts. Deep crevices are important for day roosts.	**may affect individuals,** but is not likely to result in a trend toward Federal listing or loss of viability	See analysis and effects determination above.
Townsend's big eared bat *(Corynorhinus townsendii townsendii)*	FSS, CSSC	Nocturnal, roosts in caves, uses wide variety of habitats although usually mesic areas for foraging.	**may affect individuals,** but is not likely to result in a trend toward Federal listing or loss of viability	See analysis and effects determination above.
Western red bat *(Lasiurus blossevillii)*	FSS, CSSC	Associated with riparian habitat, roosts in trees and forages over open woodlands and grasslands	No effect	Project area is outside the range of this species.
California wolverine *(Gulo gulo luteus)*	FSS, ST, SP	Remote habitats, sensitive to human presence. 4000' to 13,000' mixed habitats	No effect	Unlikely to be found near project area due to human disturbance. No verified detections in this area in recent history.
American marten	FSS, CSSC	Dense forest (>30%	**may affect individuals,**	See analysis and effects

Appendix B. Forest Service Sensitive Animal Species in Sequoia National Forest (*List Updated 10/15/2007)*

Species	Status	Habitat	Effects Determination	Rationale
(Martes americana)		canopy cover), high number of large snags and down logs, close proximity to dense riparian corridors for movement, and an interspersion of small (<1 acre) openings with good ground cover for foraging. Potential occupied elevation 4,000-13,000 ft.	but is not likely to result in a trend toward Federal listing or loss of viability	determination above.
Pacific fisher *(Martes pennanti pacifica)*	FSS, FC	Dense forest with a high number of large snags and down logs, close proximity to dense riparian corridors for movement, and an interspersion of small (<1 acre) openings with good ground cover for foraging. Potential occupied elevation 3,500-8,000 ft.	**may affect individuals**, but are not likely to contribute to the need for federal listing or result in a loss of viability.	See analysis and effects determination above.
Sierra Nevada red fox *(Vulpes vulpes necator)*	FSS, ST	Appears to prefer red fir and lodgepole forests in sub alpine and alpine zone. Forages in meadows & riparian zones. Mostly above 7,000'	No effect	No confirmed historical reports in area. Outside currently occupied range.
Amphibians				
Yellow blotched salamander *(Ensatina escholtzii croceator)*	FSS, CSSC	Valley foothill/hardwood habitats and conifer, moist habitats and down logs in tributaries of the lower Kern River.	No effect	Project area is outside of known range for this species.
Inyo Mountain slender salamander *(Batrachoceps campi)*	FSS, CSSC	Down logs and moist areas in desert. Known range limited to Inyo Mountains.	No effect	Project area is outside of known range for this species.

Appendix B. Forest Service Sensitive Animal Species in Sequoia National Forest (*List Updated 10/15/2007)*

Species	Status	Habitat	Effects Determination	Rationale
Relictual slender salamander *(Batrachoceps relictus)*	FSS, CSSC	Down logs and moist areas, generally in mixed conifer zone.	No effect	Project area is outside of known range for this species.
Tehachapi slender salamander *(Batrachoceps stebbensii)*	FSS, ST	Down logs and moist areas, below 3,500'. Limited to canyon and desert areas Tehachapi to Caliente.	No effect	Project area is outside of known range for this species.
Kern Canyon slender salamander *(Batrachoceps simatus)*	FSS, ST	Down logs and moist areas, below 3,500' Limited to Kern Canyon	No effect	Project area is outside of known range for this species.
Kern Plateau slender salamander *(Batrachoceps sp.)*	FSS, CSSC	Down logs and moist areas, ~7,000-8,000'. Limited to Kern Plateau	No effect	Project area is outside of known range for this species.
Breckenridge slender salamander *(Batrachoceps sp.)*	FSS, CSSC	Down logs and moist areas in the Breckenridge area.	No effect	Project area is outside of known range for this species.
Foothill yellow-legged frog *(Rana boylii)*	FSS, CSSC	Low gradient streams and ponds generally below 6,000'	No effect	Historically present in the Hume Lake District but no known extant populations near the project area.
Mountain yellow-legged frog *(Rana muscosa)*	FSS, FC, CSSC	Historically found in lakes and streams from 4,500-12,000'	No effect	Historically present in the Hume Lake District but no known extant populations near the project area.
Reptiles				
Southwestern pond turtle *(Actinemys marmorata pallida)*	FSS, CSSC	Low gradient ponds and streams with basking sites below 5,000 feet. Can be found up to 1 mile from perennial water.	No effect	No suitable habitat in the project area; this area lacks ponds and low gradient streams.
Sierra night lizard *(Xantusia vigilis sierrae)*	FSS, CSSC	Annual grasslands. Not known outside of limited range near Granite Station, Kern county.	No effect	Project area is outside of known range for this species.
California legless lizard *(Anniella pulchra)*	FSS, CSSC	Loose, moist soil in chaparral and valley foothill woodland. Generally	No effect	Project area is outside of known range for this species.

Appendix B. Forest Service Sensitive Animal Species in Sequoia National Forest (*List Updated 10/15/2007)*

Species	Status	Habitat	Effects Determination	Rationale
		below 6,000'.		
Fish				
Hardhead *(Mylopharodon conocephalus)*	FSS, CSSC	Warm water rivers at low elevation	No effect	Project area is outside of known range for this species.
Volcano Creek (California) golden trout *(Oncorhynchus mykiss aguabonita)*	FSS, CSSC	Cold water tributaries of the South Fork of the Kern River above Rockhouse Basin.	No effect	Project area is outside of known range for this species.

Listing Status Key: FE= Federally Endangered FT= Federally Threatened FC= Federal Candidate	FSS= USFS Sensitive Species CSSC=CA Species of Special Concern	SP= State Fully Protected SE= State Endangered ST = State Threatened